

Draft Environmental Impact
Statement for Hilton Head
South Carolina Wastewater Facilities

(U.S.) Environmental Protection Agency
Atlanta, GA

12 May 82



U.S. Department of Commerce
National Technical Information Service

NTIS

REPORT DOCUMENTATION PAGE		1. REPORT NO. EPA 904/9-81-091	2.	3. Recipient's Accession No. PB82-203993
4. Title and Subtitle Draft Hilton Head, South Carolina Wastewater Facilities Environmental Impact Statement			5. Report Date May 1982	
7. Author(s) EIS Preparation Section, EIS Branch, Region IV			6.	
9. Performing Organization Name and Address Environmental Protection Agency, Region IV 345 Courtland Street Atlanta, GA 30308			8. Performing Organization Rept. No.	
12. Sponsoring Organization Name and Address			10. Project/Task/Work Unit No.	
			11. Contract(C) or Grant(G) No. (C) (G)	
			13. Type of Report & Period Covered DRAFT EIS	
15. Supplementary Notes			14.	
16. Abstract (Limit: 200 words) This Draft EIS addresses proposed wastewater facilities for Hilton Head Island, South Carolina. Numerous wastewater management alternatives have been evaluated with particular attention to water quality in the area's surface and groundwater resources and the impacts of projected population growth on the natural and human resources of Hilton Head Island and the surrounding area.				
17. Document Analysis a. Descriptors Hilton Head Wastewater b. Identifiers/Open-Ended Terms c. COSATI Field/Group				
18. Availability Statement		19. Security Class (This Report)		21. No. of Pages
		20. Security Class (This Page)		22. Price

PB82-203993

United States
Environmental Protection
Agency

Region 4
345 Courtland Street, NE
Atlanta, GA 30365

EPA 904/9-81-091

May 1982



Environmental Impact Statement

DRAFT

Hilton Head, South Carolina Wastewater Facilities



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U.S. DEPARTMENT OF COMMERCE
SPRINGFIELD, VA 22161

DRAFT
ENVIRONMENTAL IMPACT STATEMENT
for
HILTON HEAD ISLAND, SOUTH CAROLINA
Prepared by
U.S. Environmental Protection Agency
Region IV
Atlanta, Georgia 30365

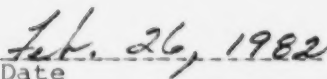
This Draft EIS addresses proposed wastewater facilities for Hilton Head Island, South Carolina. Numerous wastewater management alternatives have been evaluated with particular attention to water quality in the area's surface and groundwater resources and the impacts of projected population growth on the natural and human resources of Hilton Head Island and the surrounding area.

The comment period for the Draft EIS will remain open until May 12, 1982. Comments and inquiries should be forwarded to:

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Approved by


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Regional Administrator


Date

EXECUTIVE SUMMARY FOR ENVIRONMENTAL IMPACT STATEMENT

HILTON HEAD ISLAND WASTEWATER FACILITIES

Draft (x)

Final ()

Environmental Protection Agency
Region IV
345 Courtland Street
Atlanta, Georgia 30365

Type of Action:

Administrative Action (x)
Legislative Action ()

EXECUTIVE SUMMARY

PART A. EXISTING PROBLEM

This Environmental Impact Statement (EIS) addresses alternatives for and impacts of the provision of wastewater management facilities on Hilton Head Island. Wastewater collection and treatment on Hilton Head is principally provided by designated public service districts, which have been established by state enabling legislation. Four public service districts comprise the island as follows:

- . Sea Pines Public Service District
- . Forest Beach Public Service District
- . Broad Creek Public Service District
- . Hilton Head No. 1 Public Service District

Each public service district (PSD) operates its own wastewater treatment and disposal facilities, with the exception of the Forest Beach Public Service District. Wastewater is conveyed from Forest Beach to the Sea Pines Public Service District for treatment and disposal.

Hilton Head Plantation is served by treatment facilities owned and operated by the Hilton Head Plantation Utilities Corporation. Several small, privately-owned treatment facilities are located elsewhere on the island which provide service to isolated residential or resort areas. These include the Mariner's Cove plant and the Port Royal Inn plant which lies within the boundaries of the Hilton Head No. 1 Public Service District. The Long Cove Club, now under development, will be served by its own wastewater facilities. The remaining rural areas of the island utilize septic tank-drainfield systems.

Treated wastewater from the wastewater facilities on the island is disposed of by several methods. To a large extent, treated wastewater is used to irrigate the golf courses on the island. In a few cases, treated wastewater is sprayed onto areas of open land as a supplement to golf course irrigation. However, present wastewater flows from the Sea Pines PSD - Forest Beach PSD exceed the total irrigation demands of the golf courses located within Sea Pines and Shipyard Plantations. As a result, up to 1.8 million gallons per day (mgd) of treated wastewater are discharged into Lawton Canal and thence to Lawton Creek which is classified for shellfishing.

The 201 Facilities Plan, completed in 1975, recommended that the effluent from all treatment plants be disposed of by spray irrigation on nearby golf courses so as not to impact area shellfish waters. While conceptually sound, this scheme was based upon golf course irrigation rates which have proved to be optimistic, particularly in the case of the Sea Pines PSD and the Forest Beach PSD. The continued ability of the other PSD's on the island to dispose of their treated wastewater by golf course irrigation will depend upon the actual rate of development experienced within each.

In August 1978 the South Carolina Department of Health and Environmental Control (DHEC) closed shellfish beds in Lawton Canal and Lawton Creek, in Point Comfort Creek, and in adjacent waters of Broad Creek. These areas were closed because of high total and fecal coliform counts encountered in surface water samples. Subsequent water quality studies confirmed that shellfish standards were being violated; findings indicated that these violations were attributable to non-point source bacterial contamination.

Because of these environmental complexities and the uniqueness of Hilton Head as a barrier island, the Environmental Protection Agency decided to prepare an Environmental Impact Statement with respect to wastewater management facilities to serve the existing and future populations of Hilton Head Island. Subsequently, a Notice of Intent was issued by the EPA Regional Administrator in April, 1979. Concurrent with the Hilton Head EIS, the South Carolina DHEC initiated a study of the Lawton Creek - Broad Creek watershed in order to better define the extent to which non-point and point sources influence their bacterial characteristics. These studies confirmed the existence and magnitude of non-point contamination of Lawton Creek. Only the effluent from the Sea Pines treatment plant met water quality standards with any consistency.

Additional non-point work is now underway through the 208 program. The firm of Moore Gardner & Associates is performing the work under the direction of an advisory committee representing local, state, and Federal governments. The focus of the study is to develop effective management practice which will abate non-point pollution from island developments. Conclusions from this

work will serve as an adjunct to the findings of this EIS regarding wastewater management.

PART B. DESCRIPTION OF ALTERNATIVES

The EIS was initiated in late May, 1979. The focus of the EIS was to develop and evaluate wastewater management systems for the island which would accommodate projected populations, with emphasis placed on the method of disposal of treated wastewater. The methods generally available include golf course irrigation, discharge to surface waters, land application by either spray irrigation or rapid infiltration, and discharge to wetlands.

Projected populations and wastewater flows were developed for each of the service areas on the island and compared with on-going wastewater facility construction. Wastewater management alternatives were then formulated and evaluated with respect to costs, environmental consequences, operability, and implementability. Where on-going wastewater facility construction met or exceeded projected wastewater flows, the "no action" alternative with respect to EPA funding was judged to be the only alternative. Alternatives evaluated for each service area are discussed below.

1. SEA PINES PSD - FOREST BEACH PSD

Five wastewater management alternatives have been formulated for the Sea Pines PSD - Forest Beach PSD. Each alternative includes treatment at the Sea Pines PSD plant which is now being expanded to 3.25 mgd, irrigation of the five golf courses within the two PSD's, and the experimental wetlands discharge system which has already been approved in concept by the South Carolina DHEC and Coastal Council.

Even with irrigation of all five golf courses, a substantial amount of wastewater will remain which must be handled by supplemental means. The five alternatives are based on the following methods of disposal: (1) advanced treatment and discharge to Lawton Canal; (2) secondary treatment and discharge to Calibogue Sound via a subaqueous outfall and diffuser; (3) land application within the PSD's using a combination of spray irrigation at parcels within Forest Beach PSD immediately adjacent to the Hilton Head Golf Club, rapid infiltration within the Forest Preserve, and the experimental wetlands discharge system handling 1 mgd; (4) land application outside the PSD's by woodlands irrigation on the Gardner-Matthews tract; and (5) land application on the mainland by spray irrigation. Funding options for these alternatives were also considered, including 100 percent local funding and Federal funding contingent on non-point source control. Table ES-1 summarizes the costs, environmental impacts, and implementability of each.

TABLE ES-1
SEA PINES PSD - FOREST BEACH PSD
SUMMARY OF ALTERNATIVES EVALUATION

Alternative	Cost (Total Present Worth)	Environmental Impacts	Implementability
A. Discharge to Lawton Canal	\$1,861,900	1. Increase in size of areas closed to shellfishing will be required due to increased wastewater flows into SA waters. 2. Wastewater disposal would be eliminated as a constraint to population growth in the Sea Pines - Forest Beach Area. 3. Selection of this alternative would provide a precedent for the approval of additional surface water discharges of wastewater. 4. Selection of this alternative would provide federal support for population growth potentially causing increased urban runoff into SA waters. 5. A precedent of near-shore wastewater disposal could encourage other developments to abandon on-property disposal plans potentially resulting in a reduction of open space and higher densities.	1. NPDES permit required from DHEC. 2. New buffer zone boundary for discharge to shellfish waters must be established.
B. Discharge to Calibogue Sound	\$1,818,300	1. The discharge of treated wastewater into the SA waters of Lawton Canal and Broad Creek would be eliminated. 2. Wastewater disposal would be eliminated as a constraint to population growth in the Sea Pines - Forest Beach Area.	1. NPDES permit required from DHEC. 2. Permit required from Coastal Council. 3. Detailed studies needed during Step II to determine outfall pipe alignment and diffuser orientation.

TABLE ES-1
(con'd)

SEA PINES PSD - FOREST BEACH PSD
SUMMARY OF ALTERNATIVES EVALUATION

Alternative	Cost (Total Present Worth)	Environmental Impacts	Implementability
B. Discharge to Calibogue Sound (continued)		3. Selection of this alternative would provide a precedent for the approval of additional surface water discharges of wastewater. 4. Selection of this alternative would provide Federal support for population growth potentially causing increased urban runoff into SA waters. 5. A precedent of off-island wastewater disposal could encourage other developments to abandon on-property disposal plans potentially resulting in a reduction of open space and higher densities.	
C. Rapid Infiltration within Sea Pines Forest Preserve and spray irrigation within Shipyard Plantation.	\$6,757,000	1. This system is not technically feasible due to soil and water table conditions. 2. The discharge of treated wastewater into the SA waters of Lawton Canal and Broad Creek would be eliminated. 3. Selection of this alternative would not provide a precedent for the approval of additional surface water discharges of wastewater. 4. Wastewater disposal would be eliminated as a constraint to population growth in the Sea Pines - Forest Beach Area. 5. Selection of this alternative would provide Federal support for population growth potentially causing increased urban runoff into SA waters. 6. This alternative would utilize 67 acres of otherwise developable land.	1. Sea Pines PSD must exercise power of eminent domain to acquire land.

TABLE ES-1
(con'd)

SEA PINES PSD - FOREST BEACH PSD
SUMMARY OF ALTERNATIVES EVALUATION

Alternative	Cost (Total Present Worth)	Environmental Impacts	Implementability
D. Land application at Gardner Matthews site	\$12,609,000	1. The discharge of treated wastewater into the SA waters of Lawton Canal and Broad Creek would be eliminated. 2. Wastewater disposal would be eliminated as a constraint to population growth in the Sea Pines - Forest Beach Area up to the capacity of the spray irrigation field. 3. Selection of this alternative would not provide a precedent for the approval of additional surface water discharges of wastewater. 4. Selection of this alternative would provide Federal support for population growth potentially causing increased urban runoff into SA waters. 5. This alternative would utilize 500 acres of otherwise developable land.	1. Beaufort County must exercise power of eminent domain to acquire land for PSD use. 2. Site specific studies will be required to determine specific spray irrigation application rate.
E. Off-Island Land application	\$12,576,100	1. The discharge of treated wastewater into the SA waters of Lawton Canal and Broad Creek would be eliminated. 2. Wastewater disposal would be eliminated as a constraint to population growth in the Sea Pines - Forest Beach Area up to the capacity of the off-island force main. 3. Selection of this alternative would not provide a precedent for the approval of additional surface water discharges of wastewater. 4. Selection of this alternative would provide Federal support for population growth potentially causing increased urban runoff into SA waters.	1. Beaufort County may be required to exercise power of eminent domain to acquire land for PSD use. 2. Site specific studies will be required to determine specific spray irrigation application rate.

TABLE ES-1
(con'd)

SEA PINES PSD - FOREST BEACH PSD
SUMMARY OF ALTERNATIVES EVALUATION

Alternative	Cost (Total Present Worth)	Environmental Impacts	Implementability
E. Off-Island Land application (continued)		5. A precedent of off-island wastewater disposal could encourage other developments to abandon on-property disposal plans potentially resulting in a reduction of open space and higher densities.	
F. No Federal Action. The Sea Pines - Forest Beach PSD would implement either alternative B, D, or E with 100% local funding	Cost as presented for alternatives B, D, or E.	1. The discharge of treated wastewater into the SA waters of Lawton Canal would be eliminated. 2. Federal participation would not be provided to any alternative which would support increased urban runoff into SA waters. 3. Wastewater disposal would be eliminated as a constraint to population growth in the Sea Pines - Forest Beach Area up to the capacity of the spray site or outfall. 4. Implementation of a discharge to Calibogue Sound would provide a precedent for other surface water discharges.	1. Beaufort County might be required to exercise power of eminent domain for Alternatives D or E. 2. Permits would be required from Coastal Council and DHEC for Alternative B. 3. Site specific studies would be required on the locally selected alternative to determine spray application rate or exact outfall pipe location.
G. Federal funding conditional on non-point source solution. This option would be identical to Option F except that Federal funding would be made available if an effective implementable non-point source program is established.	Cost as presented for alternatives B, D, or E.	1. This alternative could provide incentive for the implementation of an effective non-point source program. 2. The discharge of treated wastewater into the SA waters of Lawton Canal would be eliminated. 3. Federal participation would not be provided to any alternative which would support increased urban runoff into SA waters. 4. Wastewater disposal would be eliminated as a constraint to population growth in the Sea Pines - Forest Beach Area up to capacity of the spray site or outfall. 5. Implementation of a discharge to Calibogue Sound would provide a precedent for other surface water discharges.	1. Beaufort County might be required to exercise power of eminent domain for alternatives D or E. 2. Permits would be required from the Coastal Council and DHEC for Alternative B. 3. Site specific studies would be required on the locally selected alternative to determine spray application rate or exact outfall pipe location.

A cost comparison of these five alternatives is presented below.

Alternative	Project Cost	Annual O & M	Net Present Worth
Lawton Canal	\$ 1,777,300	\$ 37,400	\$ 1,861,900
Calibogue Sound	\$ 2,033,900	\$ 17,200	\$ 1,818,300
Rapid Infiltration	\$ 7,862,400	\$ 81,000	\$ 6,757,000
Spray Irrigation at Gardner-Matthews Site	\$14,928,700	\$103,100	\$12,609,000
Spray Irrigation at Off-Island Site	\$13,827,000	\$123,700	\$12,576,100

Of additional concern in the evaluation of alternatives is the estimated increase in user costs, and the local implications of the differences. These estimates are presented below based upon EPA funding of facilities sized to dispose of the 1.8 mgd now being discharged to Lawton Canal.

Alternative	Estimate Additional	Annual User Cost
	EPA Funding	No EPA Funding
Lawton Canal	\$ 17.70	\$ 37.64
Calibogue Sound	\$ 16.75	\$ 40.69
Rapid Infiltration	\$ 48.23	\$158.64
Spray Irrigation On-Island	\$117.26	\$296.50
Spray Irrigation Off-Island	\$108.59	\$277.26

Each of the alternatives for the Sea Pines PSD - Forest Beach PSD is summarized below.

Option A:

Continued discharge to Lawton Canal.

1. Total present worth cost of \$1.8 million.
2. This alternative would allow continued discharge to shellfish waters when other reasonable options are available. This would foreclose the chance of opening the closed shellfish waters if the non-point source problem is resolved in the future. The memorandum enclosed in Appendix A indicates the position of the EPA Water Quality Standards Section.
3. The size of the closed buffer zone will increase as the wastewater flow increases. See Plate ES-1 for the buffer zone areas.
4. The selection of this alternative will set a precedent allowing surface discharges into shellfish waters.

LEGEND

- SERVICE AREA BOUNDARY
- WASTEWATER TREATMENT FACILITIES
- AREA CLOSED TO OYSTER HARVESTING BY DHEC, AUGUST 1978
- ▨ ADDITIONAL BUFFER ZONES FOR 4.0 MGD DISCHARGE FROM SEA PINES PSD PLANT INTO LAWTON CANAL

WASTEWATER TREATMENT FACILITIES INDEX

- 1 SEA PINES PSD
- 2 BROAD CREEK PSD
- 3 HILTON HEAD NO. 1 PSD
- 4 PORT ROYAL INN
- 5 HILTON HEAD PLANTATION
- 6 NORTHSIDE TRAILER PARK
- 7 MARINER'S COVE

SOUND
CALIBOGUE

ISLAND

BUCK



PINCKNEY ISLAND

JAMES F. BYRNES
BRIDGE

SKULL CREEK

7
U.S.

JARVIS CREEK

OLD CREEK

HOUSE CREEK

SQUIRE POPE ROAD

HORSE ROAD

WILD ROAD

GUMTREE ROAD

6

SOUND

SUE

SPANISH WELLS ROAD

ROAD

MARSHLAND ROAD

ROAD

BROAD CREEK

PINCKNEY

ISLAND

5

PORT

ROYAL

SOUND

SQUIRE POPE ROAD

HORSE ROAD

WILD

GUMTREE ROAD

6

BEACH

CITY

ROAD

U.S. ROUTE 27B

DRIVE

HILTON HEAD AIRPORT

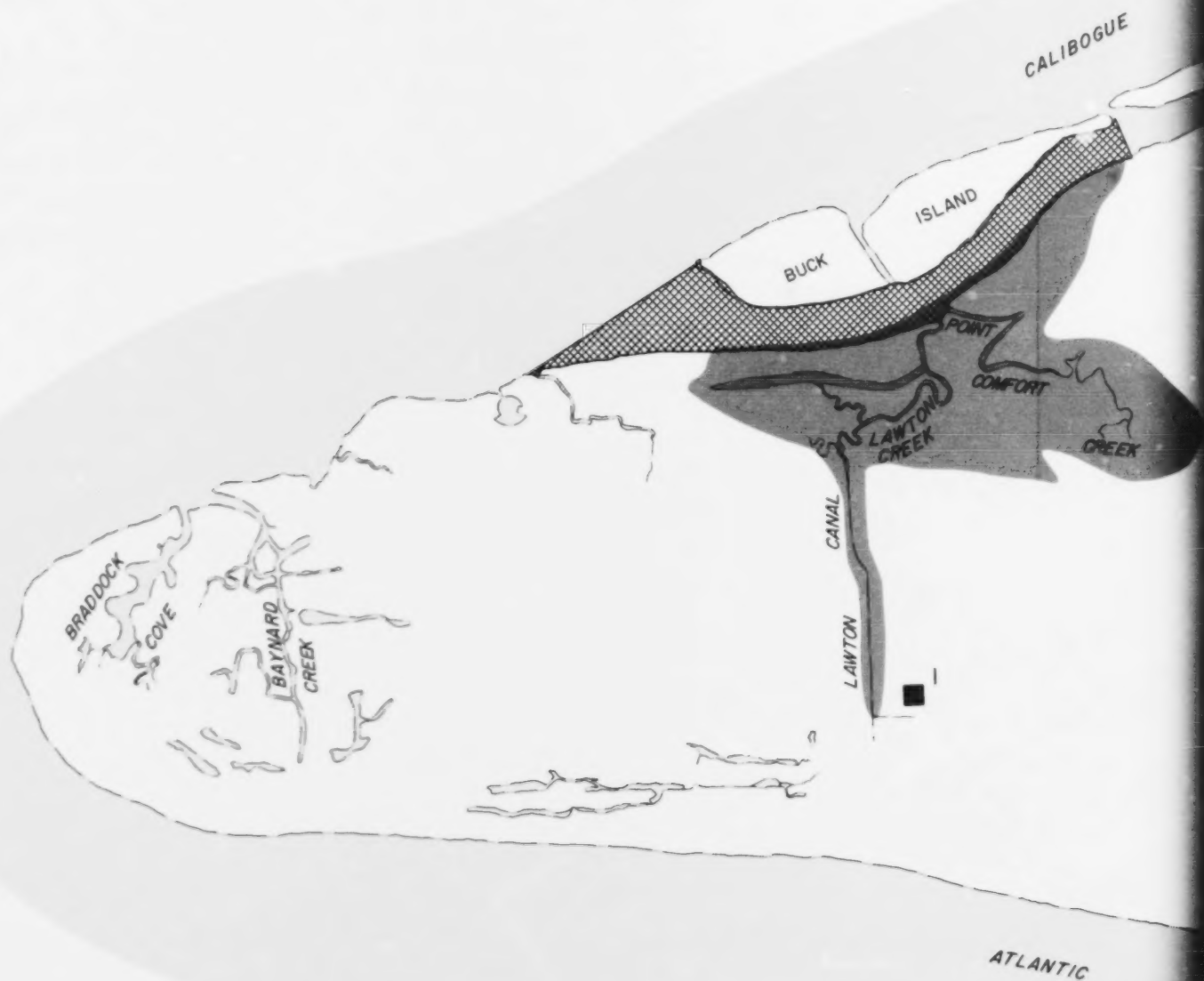
3

MATTHEWS

ROAD

4

- 2 BROAD CREEK PSD
- 3 HILTON HEAD NO. 1 PSD
- 4 PORT ROYAL INN
- 5 HILTON HEAD PLANTATION
- 6 NORTHSIDE TRAILER PARK
- 7 MARINER'S COVE



SOURCE: 1. SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL, BUREAU OF SPECIAL ENVIRONMENTAL PROGRAMS, SHELLFISH SECTION.





PLATE ES-1

HILTON HEAD ISLAND
SOUTH CAROLINA

EXISTING AND FUTURE
BUFFER ZONES



SCALE IN FEET

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION IV ATLANTA, GEORGIA

5. Federal support would promote growth and development which would increase non-point source runoff.
6. A precedent of near-shore wastewater disposal could encourage other developments to abandon on-property disposal plans potentially resulting in a reduction of open space and higher densities.

Option B:

Construction of a new subaqueous outfall for discharge to Calibogue Sound.

1. Total present worth cost of \$1.8 million.
2. Removal of unpermitted discharge to shellfish waters.
3. No buffer zone closures of shellfish beds required.
4. The S. C. Wildlife and Marine Resources Department has expressed concerns regarding surface water discharges to the area. See enclosed comment letter from this agency in Appendix B.
5. The S. C. Coastal Council has expressed concern regarding a precedent for surface discharges and greater long-range non-point source problems based on greater ultimate population.
6. Federal support would promote growth and development which will increase non-point source runoff.
7. A precedent of off-island wastewater disposal could encourage other developments to abandon on-property disposal plans potentially resulting in a reduction of open space and higher densities.

Option C:

Rapid infiltration within the Sea Pines Forest Preserve and spray irrigation within Shipyard Plantation.

1. Total present worth cost is \$6.7 million.
2. This system is not technically feasible due to soil and water table conditions.
3. Removal of unpermitted discharge to shellfish waters.
4. No precedent set for surface discharge.
5. Federal support would promote growth and development which will increase non-point source runoff.
6. 67 acres of land within Shipyard Plantation will no longer be available for development.

Option D:

Spray irrigation on Gardner-Matthews site.

1. Total present worth cost is \$12.6 million.
2. Removal of unpermitted discharge to shellfish waters.
3. Increase in disposal capacity limited by capacity of spray site.
4. Selection of this alternative will not provide a precedent for the approval of additional surface water discharges of wastewater.
5. Federal support would promote growth and development which would increase non-point source runoff.
6. Powers of eminent domain would have to be used to take land from land owner who currently has other plans for its use.
7. Site specific studies will be required to determine specific spray irrigation application rate.
8. This alternative gives the perception of a solution to the wastewater disposal problem that is limited in scope. Therefore future developments would likely be planned to manage their wastewater disposal on their own property.
9. 500 acres of land will no longer be available for development.

Option E:

Spray irrigation off-island.

1. Total present worth cost of this alternative is \$12.5 million.
2. Removal of unpermitted discharge to shellfish waters.
3. Selection of this alternative will not provide a precedent for the approval of additional surface water discharges of wastewater.
4. The purchase or lease of land could potentially be negotiated without the use of eminent domain.
5. A precedent of off-island wastewater disposal could encourage other developments to abandon on-property disposal plans potentially resulting in a reduction of open space and higher densities.
6. Federal support would promote growth and development which would increase non-point source runoff.
7. Site specific studies will be required to determine specific spray irrigation application rates.

Option F:

No Federal Action. The Sea Pines - Forest Beach PSD would implement either Alternative B, D, or E with 100% local funding.

1. The discharge of treated wastewater into the SA waters of Lawton Canal would be eliminated.
2. Federal participation would not be provided to any alternative which would support increased urban runoff pollution of SA waters.
3. Implementation of a discharge to Calibogue Sound would provide a precedent for other surface water discharges.
4. Site specific studies would be required on the locally selected alternative to determine spray application rate or exact outfall pipe alignment and diffuser orientation.

Option G:

Federal funding conditional on non-point source solution. This option would be identical to Option F except that Federal funding would be made available if an effective implementable non-point source control program is established.

1. The discharge of treated wastewater into the SA waters of Lawton Canal would be eliminated.
2. Federal participation would not be provided to any alternative which would support increased urban runoff pollution of SA waters.
3. Implementation of a discharge to Calibogue Sound would provide a precedent for other surface water discharges.
4. Site specific studies would be required on the locally selected alternative to determine spray application rate or exact outfall pipe alignment and diffuser orientation.
5. This alternative could provide incentive for the implementation of an effective non-point source program.
6. Delays final selection of project and determination of eligibility for Federal funding.

2. BROAD CREEK PSD

Present plans of the Broad Creek PSD envision expansion of the existing 0.6 mgd treatment plant to 1.2 mgd in 1981-1982. A second expansion from 1.2 to 1.8 mgd is envisioned by July 1984 and a third from 1.8 to 2.4 mgd by 1988. These plans will provide capacity beyond that required for the year 2000 OBERS population (0.64 mgd) or JPC population (0.81 mgd).

Wastewater is presently sprayed onto the Fazio golf course and an existing 20-acre spray site. As needs dictate, the Trent Jones golf course will also be irrigated with treated wastewater. These two courses and the existing 20-acre spray site are adequate to handle the OBERS and JPC-based flows projected for the year 2000. However, additional spray areas may be required to match the design capacity of the proposed 1.2 mgd plant or provisions made for a subaqueous discharge to Port Royal Sound.

The costs of the Broad Creek expansion program must be borne entirely at the PSD level. Current EPA policy prevents their participation in funding of wastewater facilities greater than the OBERS population. Consequently, the program described above for the Broad Creek PSD represents the no-action alternative with respect to federal funding.

3. HILTON HEAD NO. 1 PSD

The Hilton Head No. 1 PSD wastewater facilities primarily serve apartments, condominiums, and commercial establishments located within the boundaries of the PSD. Single-family residences within the Port Royal Plantation (except two) are served by septic tanks. Current flows average about 175,000 gpd. Treatment facilities were constructed in 1971 and consist of an unlined oxidation pond followed by two unlined holding ponds. Wastewater from the oxidation pond percolates radially into the groundwater, and DHEC has placed a moratorium on additional connections to the system.

In order to provide additional capacity, private development has constructed an interim 440,000 gpd treatment facility adjacent to the PSD's existing oxidation pond. Treated effluent is pumped from the plant, under Route 278, to Port Royal Plantation for irrigation of the Barony and Robbers Row golf courses. DHEC has approved the use of these courses for the spray irrigation of at least 800,000 gpd of wastewater.

Construction is now underway on a new 800,000 gpd plant to serve existing and future needs within the service area. Completion is scheduled for February 1982. A completely new facility is being built because of the inadequacy of the existing unlined oxidation pond. As part of the Hilton Head No. 1 project, the Port Royal Inn package plant will be abandoned and a pumping station and force main constructed to convey wastewater to the new PSD facilities. The entire project is being funded, in part, by the EPA Construction Grants Program.

The Hilton Head No. 1 PSD has recently asked DHEC to allow the 440,000 gpd "interim" facility to remain in operation after construction of the new 800,000 gpd plant has been completed. However, the existing Barony and Robbers Row golf courses cannot accommodate the total capacity of 1.24 mgd which would result, although a third golf course in the Port Royal Plantation is planned for construction by the Hilton Head Company within the next four years.

Additional EPA funding will not be available for any future needs of the Hilton Head No. 1 PSD in excess of the 800,000 gpd facilities now under

construction (no action alternative). Therefore, the costs for further expansion of the Hilton Head No. 1 PSD treatment facilities beyond 800,000 gpd and for securing additional spray irrigation areas or for surface discharge to Port Royal Sound must be borne by the PSD.

4. HILTON HEAD PLANTATION

Hilton Head Plantation is served by treatment facilities owned and operated by the Hilton Head Plantation Utilities Corporation. The Hilton Head Plantation plans to expand the existing 0.5 mgd activated sludge package plant to 1.0 mgd during 1984, based upon anticipated housing starts. The resulting capacity will be sufficient to accommodate the year 2000 population which the plantation projects. The corporation is not eligible to receive EPA grant funds for improvements and/or additions to wastewater facilities.

5. NON-PSD AREAS

Areas of Hilton Head Island which lie outside the boundaries of the Hilton Head Plantation or the existing PSD's are served by septic tank-drainfield systems, with the exception of the Mariner's Cove Club and the Northside Trailer Park. There are no areas where widespread septic tank malfunctions are known to occur.

The septic tank-drainfield system remains the preferred system for use in the non-PSD areas where soils, groundwater depth, and site conditions are acceptable. If an area should experience septic tank failures in the future, a community-sized on-lot system could be developed, or sewers extended from an adjacent PSD. Where septic tank failures occur on an individual basis, on-site improvements would be the only feasible action.

The Mariner's Cove plant provides treatment for the wastewater generated from forty units of the Mariner's Cove Club complex, which is located south of Route 278 near the bridge to Pinckney Island. Effluent from the plant is spray irrigated. Its continued operation is envisioned although increased emphasis on operation and maintenance of the plant and spray system is required.

The Northside Trailer Park is located on the north end of Hilton Head, off of Gumtree Road. Residents of the trailer park have been asked by the Hilton Head Plantation Company to vacate the property after which the existing 10,000 gpd package plant will be abandoned.

PART C. PREFERRED ALTERNATIVE

1. SEA PINES PSD - FOREST BEACH PSD

The preferred wastewater management alternative for the Sea Pines PSD - Forest Beach PSD is the Federal funding conditional on non-point source solution

alternative. Under this alternative the Sea Pines PSD would implement the most cost-effective, implementable of these disposal options: discharge to Calibogue Sound, spray irrigation at the Gardner Matthews site, or spray irrigation off-island. Federal funding for construction would be made available consistent with State priority listing, if an effective non-point source program was developed for the Sea Pines - Forest Beach area by the time the Step II design phase was complete. Detailed studies will be needed during Step II to locate an outfall and diffuser structure for the Calibogue Sound alternative. If either of the spray irrigation alternatives is selected, site specific studies to determine the appropriate specific application rate will be required.

If Federal funding is made available for Step III, facilities sized to dispose of the 1.8 mgd now going into Lawton Canal will be eligible. Any additional capacity constructed would have to be funded with 100 percent local funding.

2. OTHER AREAS OF THE ISLAND

As previously explained, the other PSD's are not eligible for Federal funding based upon the OBERS funding formula. Therefore, any facilities constructed in the near future must be done with 100 percent local funding. If appropriate planning is undertaken now by these PSD's, wastewater facilities should become available as the need arises.

The control of non-point source pollution is actually the major environmental problem on the island. This problem will grow continually worse in other areas of the island if control measures are not initiated now before development intensifies. The implementation of appropriate non-point controls such as on-lot retention and treatment through natural wetlands systems could significantly mitigate non-point source problems.

Septic tank-drainfield systems remain the preferred alternative for the non-PSD areas where soils, groundwater depth, and site conditions are acceptable. Solutions and costs for areas which experience malfunctions in the future will depend on the extent of the problem area, the affected population, and development plans for contiguous areas.

PART D. BASIS FOR DECISION

The purpose of this EIS is to select a wastewater management program for Hilton Head Island that is compatible with the protection of the area's sensitive resources, particularly water quality, while recognizing the existing extensive development pressure. The work accomplished as part of this EIS has determined that non-point source pollution is a more severe problem on the island than point source pollution. The EIS has also determined that discharge to Calibogue Sound and the two spray irrigation options are environmentally acceptable. In light of these findings, EPA selected the Federal funding conditional on a non-point source solution alternative as the preferred alternative for the Draft EIS. This is the only alternative which provides encouragement for developing a solution to the non-point source problem.

DRAFT ENVIRONMENTAL IMPACT STATEMENT
HILTON HEAD ISLAND WASTEWATER FACILITIES

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DRAFT ENVIRONMENTAL IMPACT STATEMENT
HILTON HEAD ISLAND WASTEWATER FACILITIES

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HILTON HEAD ISLAND WASTEWATER FACILITIES

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CHAPTER I - PURPOSE OF AND NEED FOR ACTION

The Hilton Head Island Environmental Impact Statement is being prepared to address the provision of wastewater management facilities to serve existing and future needs.

Hilton Head Island lies off of the southeastern tip of South Carolina about 30 miles northeast of Savannah, Georgia. Hilton Head is one of the barrier islands along the Atlantic and Gulf Coasts and is the largest ocean-front island between New York and Florida. The island is approximately twelve miles long, up to five miles wide, and covers approximately forty-two square miles.

The Atlantic Ocean borders Hilton Head to the east, Calibogue Sound to the south, and Port Royal Sound to the north. Skull Creek, which comprises a link of the Intracoastal Waterway, separates Hilton Head from the mainland. Broad Creek, a seven-mile tidal inlet which opens to Calibogue Sound, runs diagonally across the island. Plate I-1 illustrates these features.

Hilton Head Island is largely devoted to resort development. Over half the island has been developed according to the "plantation" concept. These planned unit developments contain residential, recreational, and occasional neighborhood commercial land uses. A second type of development is also resort-oriented but made up of apartments and condominium complexes. A third type of development is rural residential, found on lands owned by persons who resided on the island before resort development was undertaken. Nodes of commercial and office/institutional development which serve island residents and visitors are located along Highway 278 near Hilton Head Plantation, at Sea Pines Circle, at Forest Beach, and at Pineland Mall. The Harbour Town shopping district is located within the gates of Sea Pines Plantation.

Wastewater collection and treatment for the island is principally provided by designated public service districts, which have been established by State enabling legislation. Four public service districts (PSD's) are located on the island.

- . Sea Pines Public Service District
- . Forest Beach Public Service District
- . Broad Creek Public Service District
- . Hilton Head No. 1 Public Service District

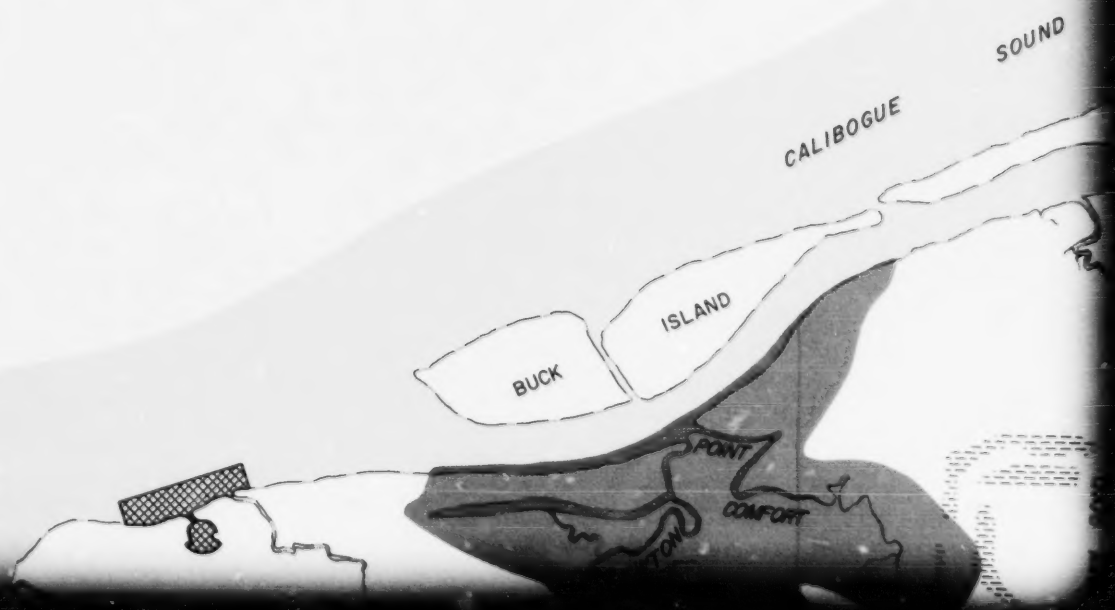
Each public service district (PSD) operates its own wastewater treatment and disposal facilities, with the exception of the Forest Beach PSD. Wastewater is conveyed from Forest Beach to the Sea Pines PSD for treatment and disposal.

LEGEND

- SERVICE AREA BOUNDARY
- WASTEWATER TREATMENT FACILITIES
- ▨ SPRAY SITES
- ▩ BUFFER ZONES AROUND MARINAS
- AREA CLOSED TO OYSTER HARVESTING BY DHEC, AUGUST 1978

WASTEWATER TREATMENT FACILITIES INDEX

- 1 SEA PINES PSD
- 2 BROAD CREEK PSD
- 3 HILTON HEAD NO. 1 PSD
- 4 HILTON HEAD PLANTATION





PINCKNEY ISLAND

JAMES F BYRNES
BRIDGE

SKULL CREEK

U.S.
ROUTE 278

SQUIRE POPE ROAD

HORSE ROAD

GUMTREE ROAD

WILD

JARVIS CREEK

OLD

HOUSE CREEK

SPANISH

WELLS

ROAD

MARSHLAND

ROAD

BROAD CREEK

TO BAY ROAD

SOUND

CALIBOGUE

CREEK

PINCKNEY ISLAND

4
SEABROOK FARM
SPRAY SITE

HILTON HEAD PLANTATION

PORT ROYAL
SOUND

SQUIRE POPE ROAD
HORSE ROAD
WILD
GUMTREE ROAD

BEACH CITY ROAD

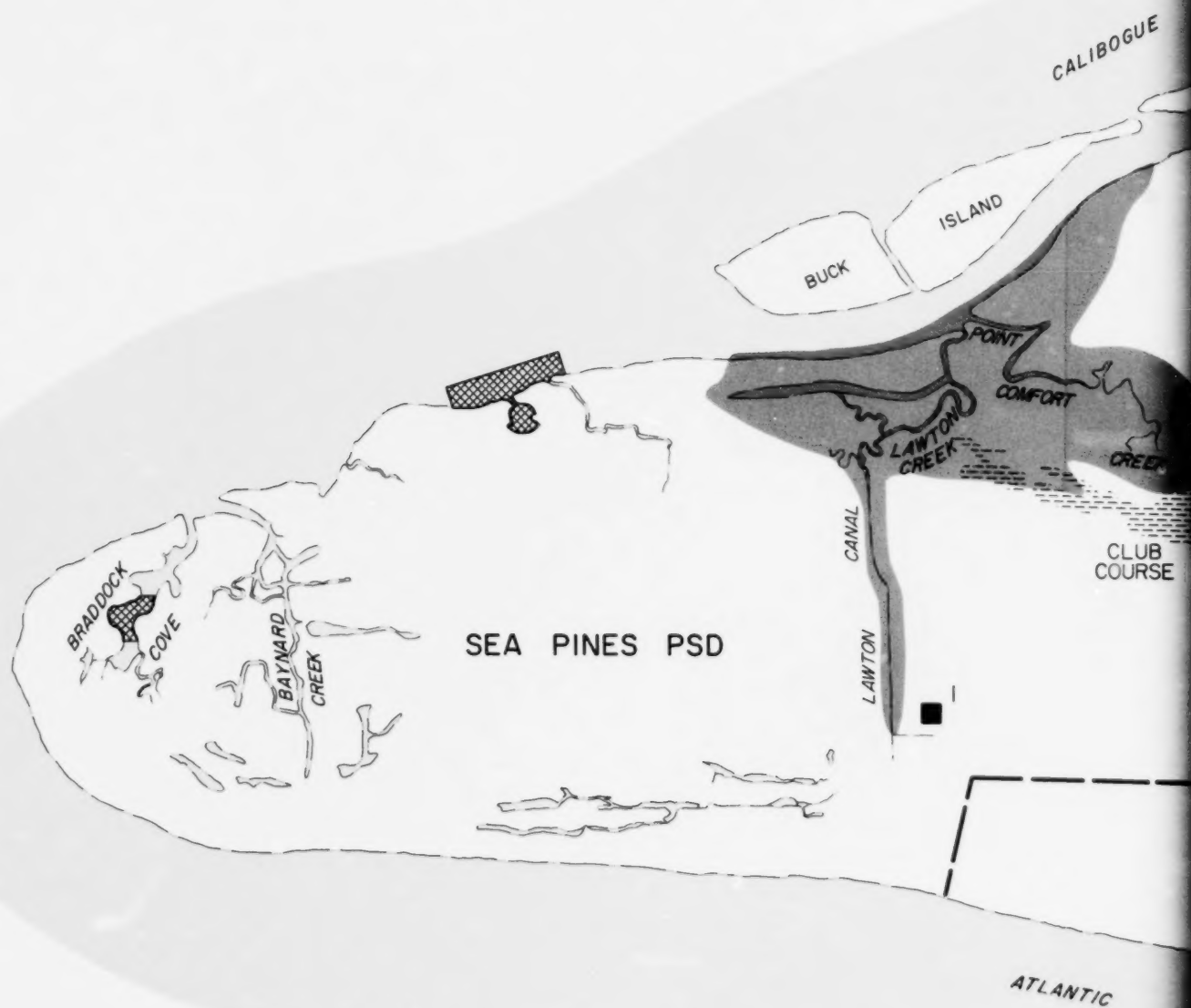
U.S. ROUTE 278
DRIVE

HILTON HEAD AIRPORT
ROBBERS ROW GOLF COURSE

ROAD

3
MATTHEWS
BARONY GOLF CLUB

- 1 SEA PINES PSD
- 2 BROAD CREEK PSD
- 3 HILTON HEAD NO. 1 PSD
- 4 HILTON HEAD PLANTATION



SOURCE: 1. SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL, BUREAU OF SPECIAL ENVIRONMENTAL PROGRAMS, SHELLFISH SECTION.



CALIBOGUE

SOUND

ISLAND

POINT

CLUB COURSE

CREEK

PALMETTO BAY ROAD

SEA PINES CIRCLE

FOREST BEACH PSD
HILTON HEAD GOLF CLUB

COLIGNY CIRCLE

ATLANTIC

OCEAN

JARVIS CREEK

HOUSE CREEK

SPANISH

WELLS

ROAD

MARSHLAND

ROAD

BROAD CREEK

20 ACRE SPRAY SITE

FAZIO GOLF COURSE

BROAD CREEK PSD

U.S.

ROUTE 278

SQUIRE

POPE

ROAD

WILD

ROAD

U.S. ROUTE 27



PLATE I-1

HILTON HEAD ISLAND
SOUTH CAROLINA

WASTEWATER
FACILITIES AND
DISPOSAL AREAS



SCALE IN FEET

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION IV ATLANTA, GEORGIA

I-1a

Hilton Head Plantation is served by treatment facilities owned and operated by the Hilton Head Plantation Utilities Corporation. Several small, privately-owned treatment facilities are located elsewhere on the island which provide service to isolated residential or resort areas. These include the Mariner's Cove plant and the Port Royal Inn plant which lies within the boundaries of the Hilton Head No. 1 Public Service District. The Long Cove Club, now under development, will be served by its own wastewater facilities. The remaining rural areas of the island utilize septic tank-drainfield systems.

Treated effluent from the wastewater facilities on the island are disposed of by several methods. Approximately 60 percent of the treated wastewater is used to irrigate the golf courses on the island. Treated wastewater is also sprayed onto areas of open land as a supplement to golf course irrigation. Present wastewater flows from the Sea Pines PSD - Forest Beach PSD exceed the total irrigation demands of the golf courses located within Sea Pines and Shipyard Plantations. As a result, up to 1.8 million gallons per day (mgd) of treated wastewater are discharged into Lawton Canal and thence to Lawton Creek which is classified for shellfishing. Existing spray areas for each PSD are displayed on Plate I-1.

During the early portion of the 1977-1978 oyster season the Shellfish and Recreational Waters Division of the South Carolina Department of Health and Environmental Control (DHEC) found fecal coliform counts which exceeded standards during a routine investigation of oyster meats from the shell stock (raw un-shucked oysters) of the Hilton Head Oyster Company. These high oyster meat coliform counts were again encountered upon sampling a second time in May 1978. Subsequent investigations and interviews with harvesters established that these oysters had been taken from Lawton Creek. Analyses of surface water samples from Lawton Creek in July 1978 revealed total and fecal coliform counts which exceeded standards. In August 1978 DHEC closed shellfish beds from "all waters and bottoms of Lawton Creek and Canal and Point Comfort Creek and the adjacent shore of Broad Creek running the length of Buck Island and Marsh". Prior to this time harvesting of oysters had only been prohibited by DHEC from "the waters and bottoms within a 1000 ft. radius of Palmetto Bay Marina, Harbour Town Marina and Baynard Cove Marina". These areas of closures are shown in Plate I-1.

These closures have since resulted in a number of special water quality studies by DHEC and one study by the U. S. Public Health Service, Food and Drug Administration, Shellfish and Sanitation Branch. These studies concentrated on the bacterial and/or hydrologic characteristics of the Sea Pines PSD Wastewater Treatment Plant, Lawton Canal, Lawton Creek, and Broad Creek. From these studies it was determined that 1) closure of these areas to shellfish harvesting was supported by water quality data and 2) there were indications that bacterial contamination arising from non-point sources in the Lawton Creek - Broad Creek drainage area was significant.

Because of these environmental complexities and the uniqueness of Hilton Head as a barrier island, the Environmental Protection Agency decided to prepare an Environmental Impact Statement with respect to wastewater management facilities to serve the existing and future populations of Hilton Head Island. Subsequently, a Notice of Intent was issued by the EPA Regional Administrator in April 1979.

Gannett Fleming Corddry & Carpenter, Inc./Claude Terry and Associates was selected by EPA to prepare the EIS. Meetings were held on the island on May 22 and 23, 1979 to solicit the views of state and local agencies, interested groups, and concerned citizens. A public scoping meeting was held on June 28, 1979 to receive additional input from the Hilton Head residents.

During the EIS process a number of major issue areas were identified. The following issues were determined to be the most significant:

1. The identification of a method or combination of methods for disposal of treated wastewater effluent, adequate for year 2000 capacity and compatible with the water quality standards designated by the South Carolina Department of Health and Environmental Control (DHEC),
2. The determination of the capacity for spray irrigation of treated wastewater effluent on the island and the impacts resulting from this wastewater disposal alternative,
3. The magnitude and causes of non-point source pollution on the island and the relationship of this pollution source to the evaluation of alternatives,
4. The extent and cause of septic tank failures on the island,
5. The disparity between OBERS Series E population projections and indicated trends based on historical growth, platted property holdings, and developer's plans and the resulting disparity in future wastewater flow projections as it impacts the need for wastewater treatment and disposal facilities, and
6. The impacts from growth supported by the provision of wastewater facilities and measures to minimize adverse effects from projected development.

Concurrent with the Hilton Head EIS, the South Carolina DHEC conducted a study of the Lawton Creek - Broad Creek watershed to better define the extent to which non-point and point sources influence their bacterial characteristics. Water quality and bacteria samples were collected during dry and wet climatic periods in order to evaluate the extent of point and non-point source contamination. A program of groundwater sampling was also conducted within Sea Pines in order to obtain additional data. These studies confirmed the existence and magnitude of non-point contamination of Lawton Creek. However, exact sources of the non-point problem were unable to be identified. Only the effluent from the Sea Pines treatment plant met water quality standards with any consistency.

Additional non-point work is now underway through the 208 program. The firm of Moore Gardner & Associates is performing the work under the direction of an advisory committee representing local, state, and Federal governments.

The focus of the study is to develop effective management practice which will abate non-point pollution from island developments. Conclusions from this work will serve as an adjunct to the findings of this EIS regarding wastewater management.

CHAPTER II - ALTERNATIVES DEVELOPMENT AND EVALUATION

PART A. INTRODUCTION

The purpose of this chapter is to provide a systematic development of all reasonable wastewater management alternatives which will adequately handle the wastewater flows projected for the year 2000 from Hilton Head Island. These alternatives are evaluated and compared so that critical differences between them can be identified. Alternatives are developed for each PSD area and for non-PSD areas.

This chapter presents a range of structural engineering alternatives and nonstructural considerations for the solution of wastewater management problems on the island. These alternatives are evaluated with respect to capital and operational costs, system operability, and implementability. Environmental consequences are presented in Chapter III.

Because the major wastewater management consideration affecting Hilton Head Island is the disposal and/or beneficial utilization of treated wastewater, the structural alternatives primarily focus on the available methods of effluent disposal. These methods generally include golf course irrigation, discharge to surface waters, land application other than golf course irrigation, and discharge to wetlands.

Non-structural wastewater considerations discussed include optimizing the use of existing facilities, flow and waste reduction measures, land use and development controls, and the control of non-point source pollution.

A no-action alternative is also presented for each of the service areas. This alternative represents the option to provide no Federal (EPA) funding toward the construction of expanded wastewater treatment capacity on Hilton Head Island. Because local and/or private funding of wastewater facilities is not precluded under this alternative, no-action does not necessarily imply no growth for Hilton Head Island.

PART B. POPULATION AND WASTEWATER FLOW PROJECTIONS

The wastewater flows which will be generated in the year 2000 are a function of the population projected for Hilton Head Island, the extent of sewer services, and the per capita water use. In order to forecast wastewater flows for the year 2000 for each of the public service districts and Hilton Head Plantation, each of these factors is evaluated separately and then combined for each service district.

1. POPULATION PROJECTION

As detailed in Chapter III, population projections have been made from both the OBERS and JPC base and disaggregated among the public service districts, the Hilton Head Plantation, and the areas of the island outside of the existing PSD boundaries. Tables III-1 and III-2 present the disaggregation of the year 2000 JPC and OBERS base population respectively. These population figures represent the maximum monthly average population during the year, based upon historical occupancy rates for rental units and seasonal residents.

2. PERCENT SEWERED

The percent of the year 2000 population which will be served by central wastewater collection and treatment facilities is dependent upon the proximity of sewers, the availability of adequate wastewater treatment and disposal capacity, and the suitability of soils for the use of on-lot systems. In order to establish the maximum needs for the treatment and disposal capacity for existing service areas, it is assumed that the existing PSD areas and the Hilton Head Plantation will be 100 percent sewered by the year 2000. This assumption is made to assure that planning considers fully adequate facilities and that worst case environmental impacts can be evaluated. However, it is not intended to preclude the use of existing on-lot systems that are functioning properly or the use of on-lot systems for new construction where soils are suitable.

3. PER CAPITA WASTEWATER FLOWS

Little data exist regarding the actual per capita wastewater flows that are generated on Hilton Head Island. Available data presented in the 201 Facilities Plan and more recent studies performed for several of the PSD's have been reviewed. Because large quantities of potable water are used for irrigation purposes, there is little correlation between metered potable water usage and the quantity of spent water that is returned back to the sewers.

The South Carolina DHEC, in Pamphlet WDG-4, presents guidelines for unit contributory loadings to wastewater treatment plants. Design loadings are based primarily upon a rate of 100 gallons per capita per day (gpcd). In the absence of more substantive data, this rate is used as a basis for initial wastewater flow projections for Hilton Head.

The wastewater generated by the resident and seasonal population of Hilton Head is taken as 100 gpcd. This rate includes an allowance for non-excessive infiltration/inflow. Wastewater generated by overnight visitors to Hilton Head Island is also taken as 100 gpcd. This rate accounts for lodging, dining, and entertainment activities as well as an allowance for non-excessive infiltration/inflow.

The wastewater generated by off-island employees and by visitors to the island who do not stay overnight is estimated at 50 gpcd. This accounts for their island activities as well as an allowance for non-excessive infiltration/inflow.

4. SUMMARY OF WASTEWATER FLOWS FOR YEAR 2000

Based upon the population disaggregations for the year 2000, the assumption of 100 percent sewer service, and the per capita wastewater flow rates for each of the population components, wastewater flows have been projected for each of the PSD's, the Hilton Head Plantation, and the non-PSD areas of the island. These flow projections are summarized in Table II-1. They represent the daily flow of the highest monthly average flow to be expected in the year 2000 based upon historical occupancy rates for rental units and seasonal residents.

It should be noted that the flow projections presented in Table II-1 are less than those projected by the individual PSD's. The differences between the flow projections, and their impact on the selected wastewater management alternative for each PSD, are discussed later in this chapter.

PART C. IDENTIFICATION OF AVAILABLE DISPOSAL METHODS

This section identifies and evaluates various disposal methods which have been considered for use on Hilton Head including: treatment and land application by slow rate irrigation, rapid infiltration, and overland flow; treatment and discharge to Lawton Canal, Calibogue Sound, Port Royal Sound, or the Atlantic Ocean; treatment and wetlands discharge; and on-lot systems.

1. TREATMENT AND LAND APPLICATION

Pre-treated wastewater can be applied to the land in order to provide further treatment or to eliminate a direct discharge of effluent to surface waters. Treatment is provided by natural processes as the applied wastewater moves through the natural filter provided by the soil, plants, and related ecosystem. Part of the wastewater is lost by evapotranspiration, while the remainder returns to the hydrologic cycle through run-off or via the groundwater system.

The three principal processes of land application of wastewater are spray irrigation, rapid infiltration, and overland flow. All three methods require the prior treatment of wastewater to levels adequate to protect public health, preclude odor problems, and prevent clogging of soils or the distribution system due to excessive solids.

TABLE II-1
WASTEWATER FLOW PROJECTIONS
FOR YEAR 2000, IN GPD (1)

Area	OBERS	JPC
Sea Pines PSD	1,722,800	1,977,150
Forest Beach PSD	1,129,200	1,385,050
Broad Creek PSD	638,600	807,450
Hilton Head No. 1 PSD	620,300	764,900
Hilton Head Plantation	308,700	438,350
Long Cove Club	106,300	141,150
Non-PSD Areas	258,650	345,700
TOTAL	4,784,550	5,859,750

(1) Daily flows based on highest monthly average flow during maximum summer visitor occupancy.

Golf course irrigation using treated wastewater serves as the basis for wastewater management systems on Hilton Head. The ability of the golf courses to utilize all of the treated effluent which will be generated by the projected year 2000 peak population varies within each PSD, and as a result, supplemental methods for effluent disposal may be required.

Irrigation (Slow Rate)

Irrigation is the predominant land application technique in use today. It involves the application of pre-treated wastewater onto the land either by sprinkler or by surface flooding in order to support plant growth. Wastewater is applied at rates between 0.5 and 4 inches per week; the applied wastewater is absorbed by plant uptake, lost to the air by evapotranspiration, and absorbed into the groundwater by percolation. Wastewater which percolates through the soil matrix is renovated by physical, chemical, and biological processes. A well-drained soil is preferred. In general, soils ranging from loose clays to sandy loams are suitable.

Slow rate irrigation is generally capable of producing the best results of the land treatment systems. Organics are substantially reduced by biological oxidation within the top few inches of the soil. Suspended solids and fecal coliform are filtered as the wastewater passes through the soil matrix. Nitrogen is primarily removed by vegetative uptake; phosphorus is removed from solution by fixation processes in the soil and by vegetative uptake.

To date, spray irrigation has been the method of choice on Hilton Head Island. The systems on Hilton Head have involved the spraying of secondary-treated wastewater onto golf courses and onto other areas specifically designated for receiving wastewater effluent. The long-term commitment of undeveloped open lands on the island to serve as dedicated spray areas could be utilized to supplement the continued irrigation of existing and future golf courses. The land could be cleared so that wastewater could be applied by means of a center pivot or traveling gun system, or the land could be left in a wooded state and wastewater applied through a solid-set distribution system.

Rapid Infiltration (High Rate)

In rapid infiltration systems, pre-treated wastewater is applied to the land at high rates (4 to 84 inches per week) by flooding in surface basins or high-rate sprinkling. Renovation of the applied wastewater occurs as it passes through the soil matrix. The renovated wastewater can be used for (1) groundwater recharge, (2) natural treatment followed by recovery of the percolated wastewater through pumped withdrawal or collection by underdrains, (3) natural treatment with renovated waters moving vertically and laterally through the soil and recharging nearby surface waters, or (4) temporary storage in the aquifer.

Soils with infiltration rates of 4 inches to 2 feet per day are required for a successful rapid infiltration system. The depth to groundwater should be at least 10 feet. Acceptable soil types include sands, sandy loams, loamy sands, and gravel. Renovation of the applied wastewater results from the filtering and straining action of the soil matrix. Suspended solids, BOD, and fecal coliforms are almost completely removed in most cases. Nitrogen removal is generally poor unless specific operating procedures are established to maximize denitrification.

Other important considerations for a rapid infiltration system include percolation rates; depth, movement, and desired quality of the groundwater; topography; and underlying geologic formations. Subsoil and aquifer characteristics must be known in order to control the wastewater after it infiltrates the surface and percolates through the soil matrix. Recharge should not be attempted without specific knowledge of the movement of the water in the soil system and the groundwater aquifer.

A major constraint for using rapid infiltration on Hilton Head is the growing concern that the island is a recharge area for the principal artesian aquifer. This aquifer serves as the primary source of water for users on the island. Because rapid infiltration does not remove nitrogen from applied wastewater as completely as other land application techniques, there is concern that nitrates could enter the principal artesian aquifer. Consequently, further detailed studies would be needed and appropriate special precautions could be required for any full-scale rapid infiltration system located on the island.

Overland Flow

Overland flow involves the application of pre-treated wastewater over the upper reaches of sloped terraces. The applied wastewater is allowed to flow across the vegetated surface to runoff collection ditches. As the wastewater flows down the slope in a thin sheet, it is renovated by physical, chemical, and biological processes. The collected wastewater may either be discharged to surface waters or recycled back to the land.

Clayey soils with limited drainability are suited for an overland flow system. The land should have a slope between 2 to 8 percent and a smooth surface without ridges and depressions so that the wastewater will flow in a thin sheet over the ground surface. Conditions on Hilton Head Island are generally not favorable for the use of overland flow as a land application technique. Sandy soils predominate on the island, and extensive grading would be necessary to develop an application site with slopes between 2 and 8 percent as required for an overland flow system.

2. TREATMENT AND DISCHARGE

Another alternative for the disposal of wastewater involves treatment and discharge to surface waters. The level of treatment must be adequate to meet established water quality standards. A minimum of secondary treatment is required by the U. S. Environmental Protection Agency (30 mg/l* each for BOD₅ and suspended solids). Additional treatment may be required depending upon uses of the receiving stream and its ability to take the waste without violating water quality standards (assimilative capacity). Waters surrounding Hilton Head include the near-shore waters of Lawton Canal, Lawton Creek, and Broad Creek and the off-shore waters of Calibogue Sound, Port Royal Sound, and the Atlantic Ocean. These waters are shown in Plate II-1. The South Carolina DHEC has set forth treatment requirements for discharges into these waters based upon their assimilative capacity. These requirements are presented in Table II-2. A secondary level of treatment is indicated for Calibogue and Port Royal Sounds; a higher level of treatment (lower numerical effluent limits) is required for a discharge into the Lawton Creek complex.

An additional consideration for any discharge to the surface waters surrounding Hilton Head is their classification for shellfishing. Under the requirements of the National Shellfish Sanitation Program (NSSP) Manual of Operations, the discharge of treated wastewater to shellfish waters requires a buffer zone around the discharge point from which the harvesting of shellfish is prohibited. The purpose of the buffer zone is twofold: (1) to ensure that public health is protected by preventing contamination of shellfish waters by disease-causing organisms (pathogens) from normally operating treatment works, and (2) to provide time for notification to cease harvesting in the shellfish growing waters beyond the buffer zone following a malfunction of the wastewater treatment facility.

The buffer zone for the present Sea Pines PSD discharge to Lawton Canal includes all of Lawton Creek to its confluence with Broad Creek and the adjacent shore of Broad Creek generally opposite Buck Island. According to a Food and Drug Administration report (December 1978), this buffer zone would be extended to just above Harbour Town Marina to the south and to the northern tip of Buck Island to the north for the full width of Broad Creek for a discharge of 4.0 mgd from the Sea Pines Plant. Plate II-1 depicts the existing and proposed buffer zones as described above.

A discharge through an underwater outfall and diffuser into either Calibogue Sound, Port Royal Sound, or the Atlantic Ocean is not anticipated to result in the closure of shellfish beds. Detailed studies would be needed to determine the optimal location and orientation of the diffuser structure to ensure maximum mixing and dispersion of the effluent and thereby minimize adverse impacts on water quality.

*mg/l - milligrams per liter approximately equivalent to one part by weight of material in 1,000,000 parts of water.

TABLE II-2
EFFLUENT REQUIREMENTS FOR
DISCHARGES TO SURFACE WATERS(1)

Receiving Stream	Discharge Flow	BOD ₅	NH ₃ -N	Suspended Solids	Ultimate Oxygen Demand	
					Total	Allowable
Lawton Canal	3.0 mgd	10 mg/l	1.5 mg/l	15 mg/l	546 lbs/d	--
Calibogue Sound	3.0 mgd	30 mg/l	--	30 mg/l	3,378 lbs/d	9,000 lbs/d
Port Royal Sound	1.0 mgd	30 mg/l	--	30 mg/l	1,126 lbs/d	28,000 lbs/d
Atlantic Ocean	3.0 mgd	30 mg/l	--	30 mg/l	3,378 lbs/d	--

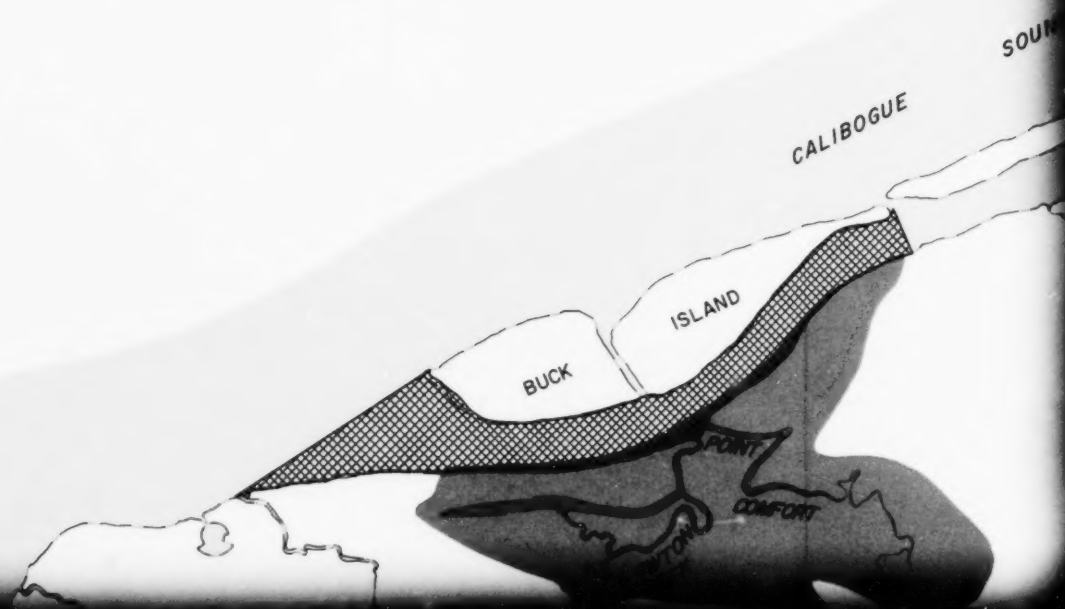
(1) Based upon determinations by South Carolina Department of Health and Environmental Control.
See Appendix C for letter.

LEGEND

- SERVICE AREA BOUNDARY
- WASTEWATER TREATMENT FACILITIES
- AREA CLOSED TO OYSTER HARVESTING BY DHEC, AUGUST 1978
- ▨ ADDITIONAL BUFFER ZONES FOR 4.0 MGD DISCHARGE FROM SEA PINES PSD PLANT INTO LAWTON CANAL

WASTEWATER TREATMENT FACILITIES INDEX

- 1 SEA PINES PSD
- 2 BROAD CREEK PSD
- 3 HILTON HEAD NO. 1 PSD
- 4 PORT ROYAL INN
- 5 HILTON HEAD PLANTATION
- 6 NORTHSIDE TRAILER PARK
- 7 MARINER'S COVE





PINCKNEY ISLAND

JAMES F BYRNES
BRIDGE

SKULL CREEK

7
U.S.

ROUTE 278

JARVIS CREEK

SQUIRE POPE ROAD

HORSE ROAD

WILD

GUMTREE ROAD

OLD

HOUSE CREEK

ROAD

SPANISH

WELLS

MARSHLAND

ROAD

BROAD CREEK

SOUND

CALIBOGUE

BAY ROAD

PINCKNEY ISLAND

5

HILTON HEAD PLANTATION

PORT ROYAL SOUND

SQUIRE POPE ROAD

HORSE ROAD

WILD

GUMTREE ROAD

6

BEACH CITY ROAD

U.S. ROUTE 278

DRIVE

HILTON HEAD AIRPORT

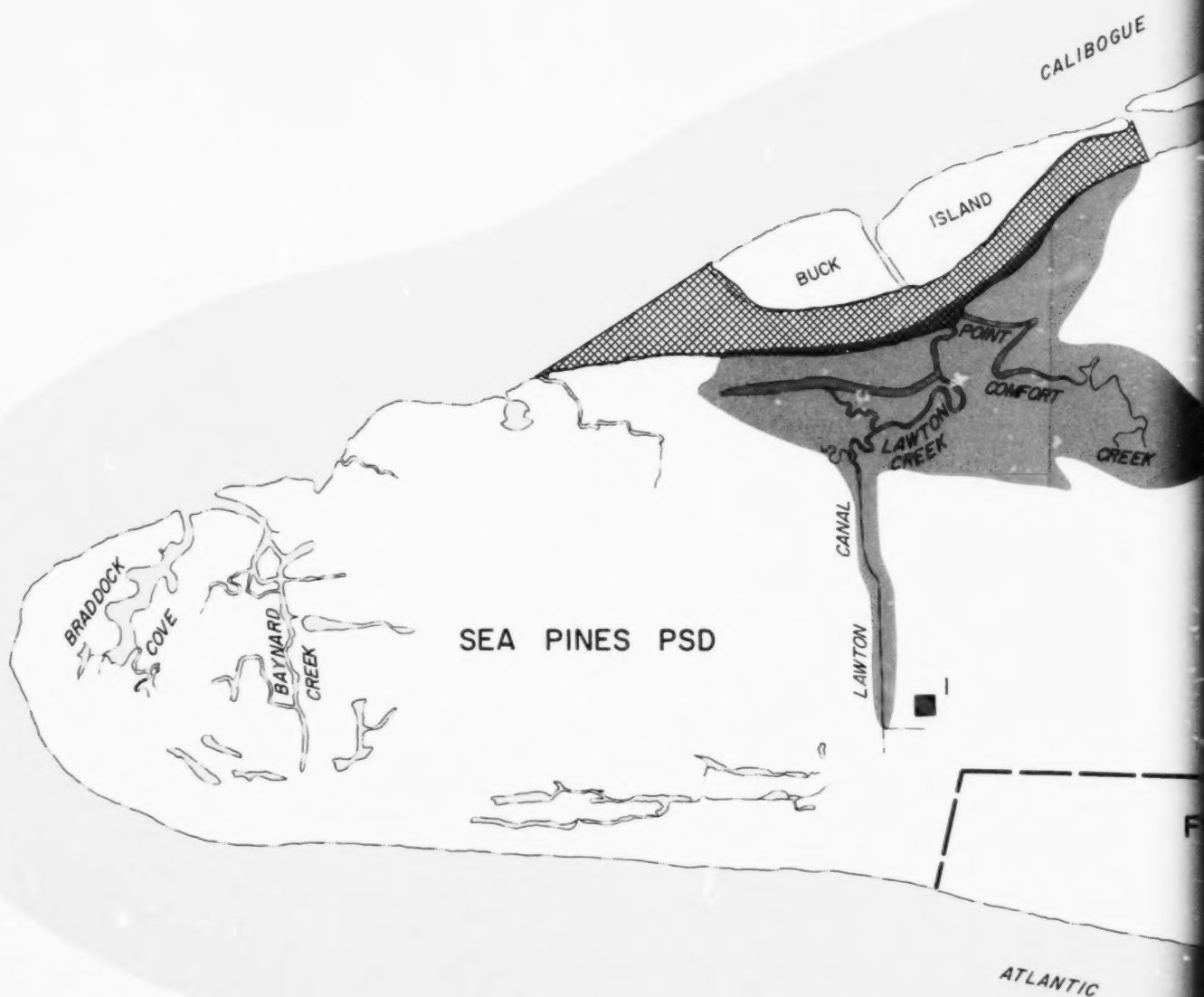
MATTHEWS

3

4

ROAD

- 1 SEA PINES PSD
- 2 BROAD CREEK PSD
- 3 HILTON HEAD NO. 1 PSD
- 4 PORT ROYAL INN
- 5 HILTON HEAD PLANTATION
- 6 NORTHSIDE TRAILER PARK
- 7 MARINER'S COVE



SOURCE: 1. SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL, BUREAU OF SPECIAL ENVIRONMENTAL PROGRAMS, SHELLFISH SECTION.



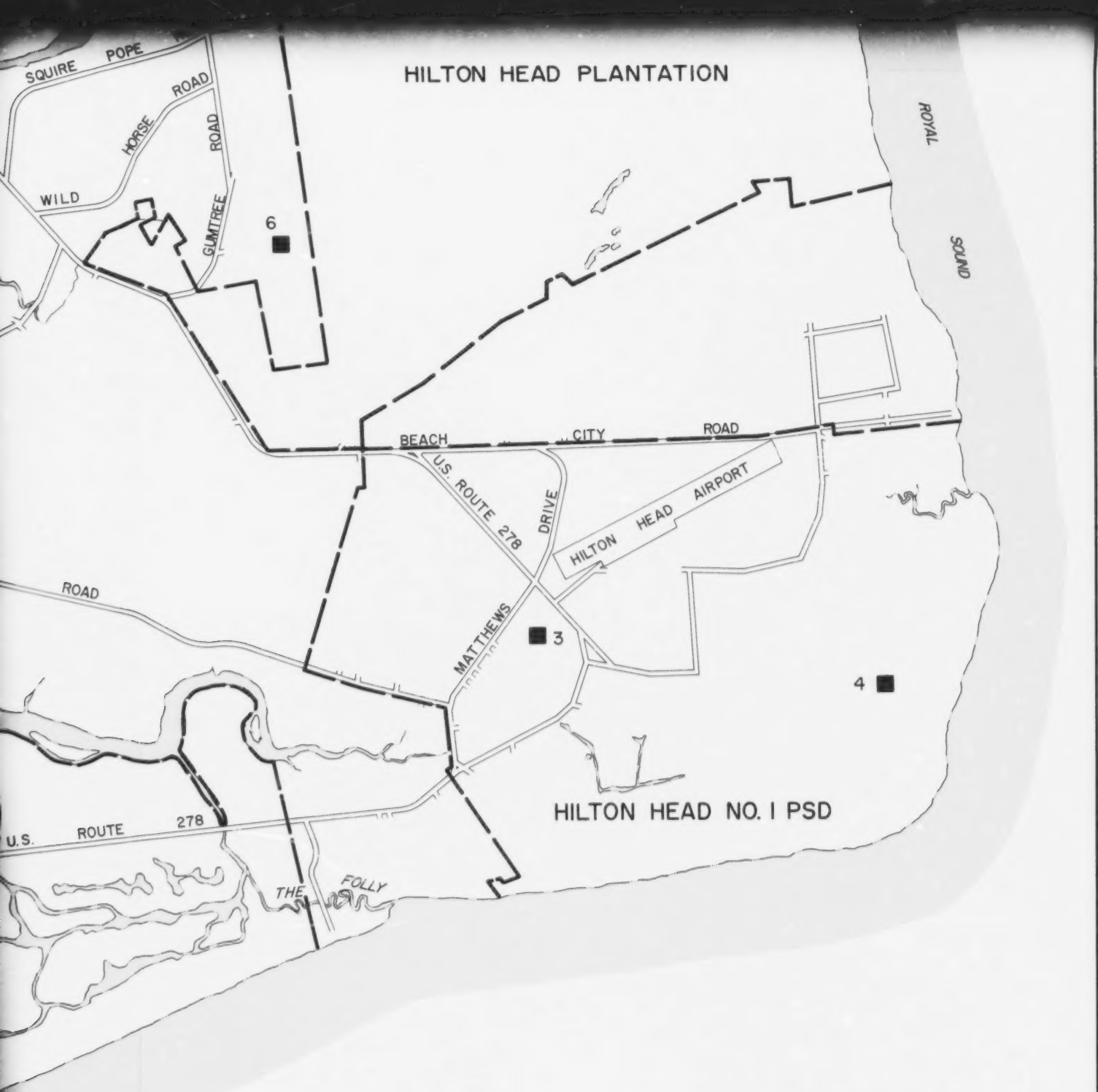


PLATE II-I
HILTON HEAD ISLAND
SOUTH CAROLINA
RECEIVING STREAMS AND
BUFFER ZONES



SCALE IN FEET

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION IV ATLANTA, GEORGIA

11-8a

3. TREATMENT AND WETLANDS DISCHARGE

The term wetlands is a broad classification covering areas known as marshes, bogs, wet meadows, peatlands, and swamps. They generally consist of low-lying, usually level, saturated land which is partially or intermittently covered with standing water. In wetland discharge systems, wastewater is renovated by the soil, plants, and microorganisms as it moves through the soil profile. However, renovation action is usually more dependent on microbial and plant activity than on soil chemistry. The ability of wetlands to influence water quality has precipitated much current research into their use for wastewater management. Both artificial and existing wetlands have been studied, using untreated as well as secondary effluents.

Tidal marshes occupy a significant area of Hilton Head Island; however, their proximity to areas which are suitable for shellfishing preclude their consideration as a part of a controlled wastewater management system. Freshwater marsh and freshwater swamp forest areas also exist on the island. The Nancy Cathcart Chapter of the Sierra Club has endorsed discharging a portion of the treated effluent from Sea Pines PSD - Forest Beach PSD into drainage-ways of the Sea Pines Forest Preserve as a means to restore the area's wetlands. Periods of drought and diversion of natural recharge into the Preserve have dried up many wetlands areas within the Preserve thereby drastically altering the natural habitat. The South Carolina DHEC and the South Carolina Coastal Council have both approved this concept on an experimental basis. The design of the system is now in preparation.

Cypress Swamp and Whooping Crane Pond areas in Hilton Head Plantation are also affected by periodic drought conditions. Both of these areas serve as bird rookeries and as the habitat for numerous wildlife species. Cypress Swamp contains the only stand of bald cypress on the Sea Islands, while Whooping Crane Pond is the only swamp area in lower South Carolina that combines mature tupelo trees with open water. A proposal from the Hilton Head Plantation Utility Company to utilize treated wastewater to revive the Cypress Swamp Conservancy is now under consideration by DHEC.

4. SYSTEMS FOR UNSEWERED AREAS

The majority of the areas which lie outside the boundaries of the Hilton Head Plantation or the existing PSD's utilize septic tank-drainfield systems. Wastewater management for these areas may take one of several forms, dependent upon whether existing septic tank systems are functioning properly.

Individual Systems

Conventional septic tank-drainfield systems are the simplest and least expensive on-lot systems, if properly sited and maintained. Existing septic

tank systems that are functioning properly will continue to be used in the non-PSD areas; where soils are suitable, the use of septic tank-drainfield systems are envisioned for new construction. Where septic tank failures occur on an isolated basis, improvements would be made to the individual home.

The DHEC Bureau of Environmental Sanitation acts upon all septic tank applications for individual residences. Applications for larger systems (greater than 1,500 gpd) are reviewed by the Bureau of Wastewater and Stream Quality Control of DHEC. Site evaluations are conducted by DHEC for every site for which application has been made for installation of a septic system. Consideration is given to soil texture; depth to groundwater; and distances from wells, ditches, bodies of water, and property lines. The minimum allowable depth to groundwater is 36 inches; modification of the site through grading and filling may be used to achieve this minimum separation on a case-by-case basis. Recommended minimum lot sizes are 12,500 square feet for homes served by a community water system and 30,000 square feet where water is provided by an on-site well.

The soils on Hilton Head Island are generally poorly drained, moderately permeable sands, loamy fine sands, and sandy loams. Fifteen general soils series have been identified on Hilton Head; these determinations have been made on-site by soil scientists of the Soil Conservation Service (SCS), U. S. Department of Agriculture.

Of the fifteen soil series, only the Wando series has been given a "slight" classification by the SCS. (Other soil series have been given "severe" classifications primarily due to seasonally high groundwater). A "slight" classification usually means that any soil limitations are minor and easily overcome and that septic tanks should work properly when adequately sized, correctly installed, and regularly maintained. Plate II-2 shows the location and extent of the Wando series on Hilton Head. As shown, there are large areas of the Wando series along Route 278 from approximately Palmetto Dunes to Sea Pines Circle, in the Matthews Drive - Port Royal area, between Route 278 and Marshland Road, and north and west of the Hilton Head Airport.

Other areas of the island may be suitable for septic tank systems, or be made suitable by moderate site improvements such as grading or filling. Such areas, however, must be determined based upon a site survey on a lot-to-lot basis. If soil limitations are severe, use of modified septic tank/soil absorption systems may sometimes be used. Site modifications may include grading or filling, or both; absorption system modifications may include constructing subsurface sand filters or elevated sand mounds.

Elevated sand mounds are used in conjunction with septic tanks. The elevated sand mound is simply a mound of sandy fill material which is placed on the surface of the ground. The sandy fill serves as a physical and biological medium in which the septic tank effluent is filtered before being absorbed by the natural soil. In cases of failing systems, an elevated sand mound would replace the existing sub-surface drainfield. Use of an elevated sand mound would require that effluent from the septic tank be pumped to the mound for disposal.

LEGEND

- — — SERVICE AREA BOUNDARY
- AREAS SERVED BY SEPTIC TANKS
- ▨ WANDO SOILS





PINCKNEY IS

JAMES F. BYRNES
BRIDGE

SKULL CREEK

U.S. ROUTE 278

JARVIS CREEK

OLD

HOUSE CREEK

ROAD

WELLS

SOUND

CALIBOGUE

ISLAND

POINT

COMFORT

CREEK

TO BAY ROAD

BROAD CREEK

MARSHLAND

ROAD

PINCKNEY ISLAND

HILTON HEAD PLANTATION

PORT ROYAL SOUND

BEACH

HILTON HEAD AIRPORT

US ROUTE 224

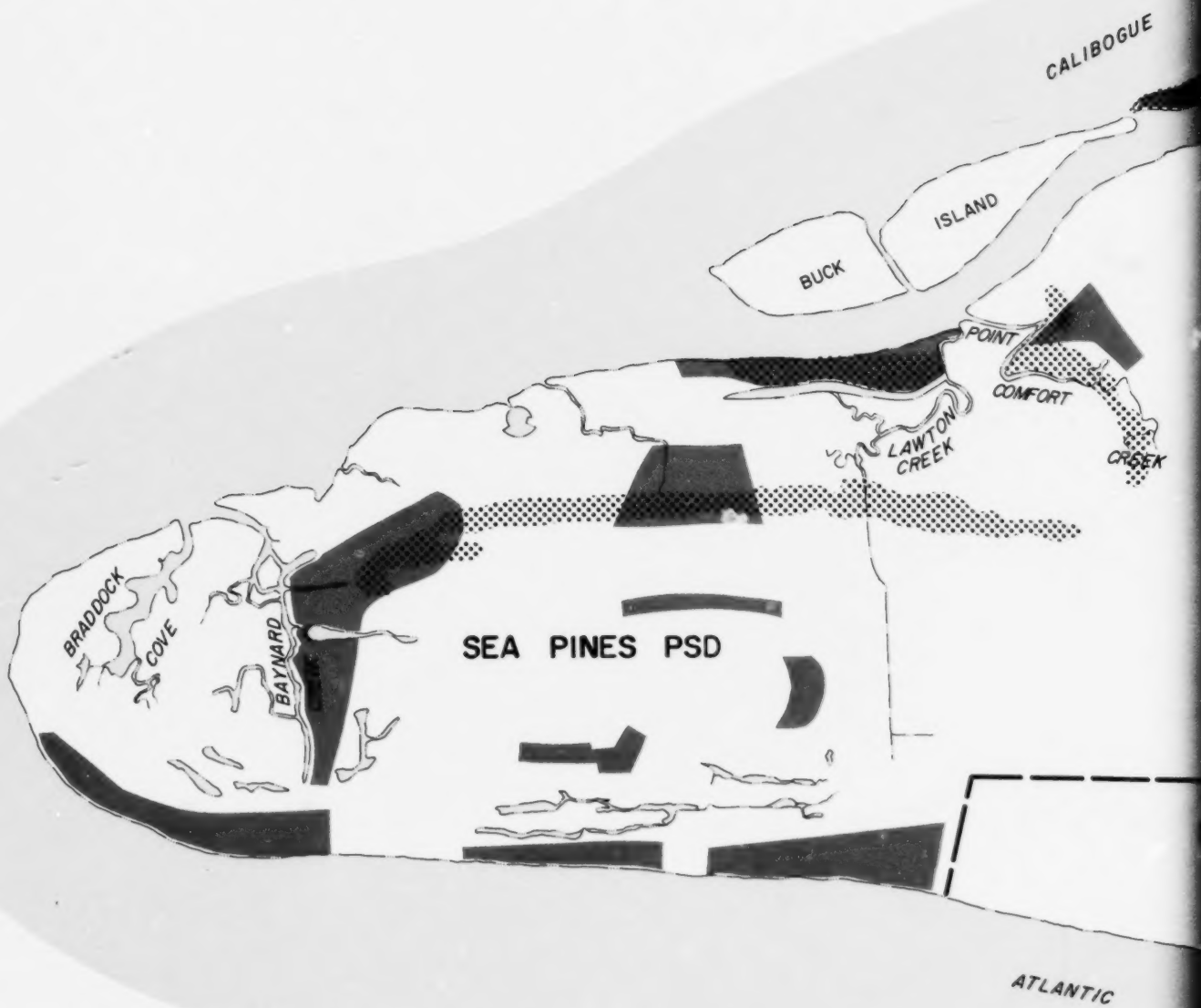
MATTHEWS

ROAD

GUMTREE ROAD

POPE ROAD





I-10-a



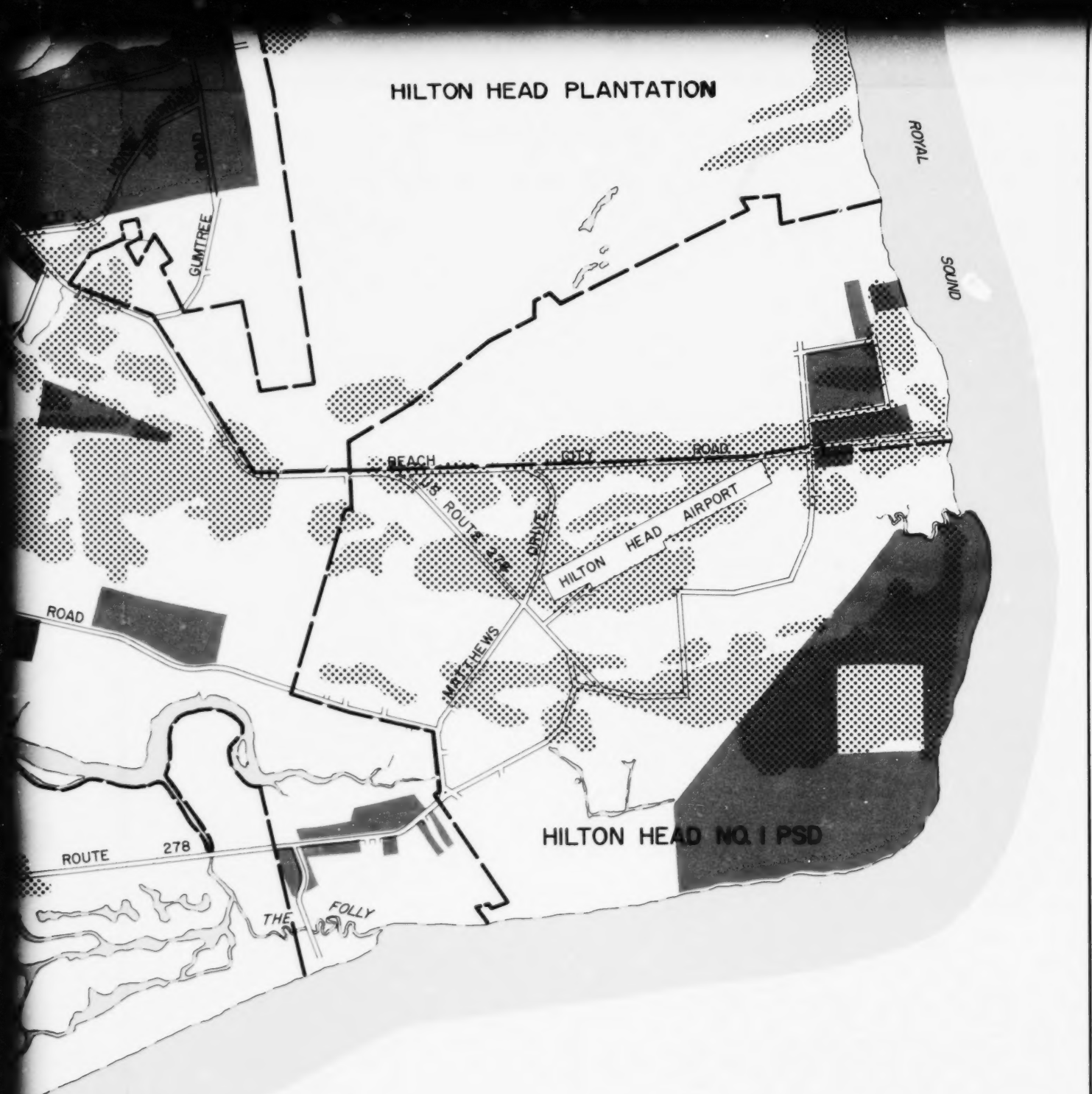


PLATE II-2

HILTON HEAD ISLAND
SOUTH CAROLINA

WANDO SOILS AND
SEPTIC TANK AREAS



SCALE IN FEET

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION IV ATLANTA, GEORGIA

Community Systems

The community approach to wastewater management involves the collection, treatment, and disposal of sewage from a number of homes. Community systems would be utilized where septic tank failures occur on a widespread basis, where soils in a general area are unsuitable, or in areas of higher population density.

There are several candidate alternatives for community systems which could prove effective for the non-PSD areas. These alternatives are discussed below.

Community Sand Mound - Where failing septic tank systems exist at a number of homes within a small area, a community sand mound system could be utilized. A community sand mound is used in conjunction with the septic tanks at each home. Wastewater is pumped from each septic tank to the community mound system for application. The mound must provide an adequate amount of unsaturated soil and spread the septic tank effluent over a sufficient area so that distribution and purification can occur before the water table is reached.

Package Plants - A second alternative available for the non-PSD areas involves the construction of a package wastewater treatment plant to handle flows from the community. Spray irrigation of treated effluent would likely be required because of inadequate receiving streams available for discharge.

Conveyance to PSD - Wastewater may be conveyed from the community to an existing PSD for treatment and disposal. A pumping station and force main are required for this alternative.

PART D. NON-STRUCTURAL WASTEWATER MANAGEMENT CONSIDERATIONS

Effective and functional non-structural control mechanisms for wastewater management can be an important adjunct to the construction of wastewater collection and treatment facilities. Non-structural considerations include a variety of regulatory, administrative, and educational procedures which can be used to supplement structural water quality control techniques. The application of non-structural methods may provide a means for lessening the magnitude of structural facilities required for attainment and maintenance of water quality standards. Therefore, the principal focus of non-structural alternatives is their use in supporting and supplementing structural alternatives and solutions. Non-structural alternatives typically require widespread community support but are also typically less expensive than structural alternatives.

1. OPTIMUM USE OF EXISTING WASTEWATER FACILITIES

Very often, wastewater treatment facilities do not perform at their designed efficiency. No matter how well planned, how well designed, or how well constructed, provisions must be made for the proper operation and maintenance of wastewater facilities. The objective of efficient operation and maintenance is to continuously meet the effluent quality performance limits required by state permits, to make plant operations as economical as possible consistent with meeting the required effluent limits, and to reduce the need for repair and replacement of mechanical and electrical equipment at the plant.

A well trained staff is required to ensure good plant operation and maintenance. For the most part, wastewater treatment facilities on Hilton Head appear to be adequately operated and maintained; efforts should be made to provide continued training for the operators. One facility where an inadequate program of operation and maintenance has existed is the Mariner's Cove treatment plant which serves about forty units of the Mariner's Cove Complex. During the period from approximately May 1979 through September 1979, the Mariner's Cove system was either out of operation or operating marginally. As a result of equipment failures, raw or inadequately treated wastewater was intermittently discharged to Skull Creek. This occurrence emphasizes the often overlooked need to provide regular operation and maintenance at smaller wastewater facilities.

2. FLOW AND WASTE REDUCTION MEASURES

Another non-structural technique that can be employed in wastewater management is the use of water conservation and flow reduction techniques. Benefits can include reduced water supply demand, reduced treatment operating costs, relieving overloaded wastewater treatment and disposal facilities, and reduced capital cost and capacity required for new facilities.

Several non-structural measures are available for use in the Hilton Head study area to reduce future water use and wastewater flow. They include plumbing codes, building permits to enforce certain construction practices, flow control devices, and educational programs. Water and wastewater pricing can sometimes be effective toward reducing water consumption and, hence, wastewater flows. However, water and wastewater pricing do not appear to be a particularly effective technique for reducing wastewater flows on Hilton Head.

Use of indoor water-saving devices can reduce wastewater flows. Numerous water-saving devices have been manufactured for all water-using appliances or fixtures in the home. Use of these devices can be expected to have a greater impact on the growth areas of Hilton Head due to the ease with which they can be installed in new residential units. Table II-3 presents a listing of typical water-saving devices and potential water savings.

TABLE II-3

SUMMARY OF INDOOR RESIDENTIAL WATER-SAVING DEVICES

Device	Water Use (gal/flush or gal/minute)	Expected Water Savings		Average Cost to Install (\$)
		Unit (gpcpd)	Percent of Total Household Use	
<u>Toilet Alteration</u>				
Displacement Device	-	2.5	4.0	0-6
Toilet Dam	-	5.5	8.0-20.0	1-6
Shallow-Trap Toilet	3.5	7.5-12.5	11.0-18.0	13-75
Dual-Cycle Toilet (Toilet Flush Adaptor)	1.25-2.50	17.5-25.0	25.0-36.0	4-14 (Device) 0-65 (New Tank)
Without Alteration	5.0-7.0	-	-	-
<u>Shower Alteration</u>				
Flow Control Devices	2.5-3.5	6.3-9.5	9.0-13.6	1-7
Aerators	1.5-3.0	7.0-10.0	10.0-14.0	1-5
Automatic Shut-Off Valves	-	6.0	9.0	0-2
Without Alteration	5.0-7.0	-	-	-
<u>Faucet Alteration</u>				
Flow Control Devices	0.5-2.5	0.5	0.8-1.6	1-5 (Modification)
Aerators	2.0-3.5	0.5	0.8-1.5	10-30 (New)
Spray Taps	1.0-2.0	0.75	2.0	1-2
Without Alteration	5.0-6.0	-	-	20-50 (New)

The Beaufort County Plumbing Code is based upon the Southern Standard Plumbing Code, 1979 edition. The regulations in the code do not require the use of water-saving devices, such as those described above. The County may wish to consider amendment of the plumbing code to require the use of water saving devices in all new construction.

3. LAND USE AND DEVELOPMENT CONTROLS

Increases in Hilton Head's resident and tourist population has had and will continue to have significant impacts on wastewater management. As population increases, vacant land is converted to an assortment of uses such as residential and commercial development and street and highway uses. This can generate increased storm runoff which may significantly degrade surface water quality depending on the type and location of development. In addition, wastewaters generated by new development must be assimilated by a limited land and water system.

Land development controls are an important aspect of water quality management planning. Land use regulations can be used to direct development away from sensitive environmental areas, including water quality sensitive areas. Land use controls can also serve to mitigate any short-term or long-term negative impacts that may result from the provision of wastewater treatment and disposal facilities.

Act 487 of South Carolina Acts of 1967 gives counties and municipalities the authority to establish planning commissions and prepare comprehensive plans for their jurisdictions. The Beaufort Joint Planning Commission was established in February 1969 and has the power to plat land, enact zoning ordinances, and provide other development controls in Beaufort County and its municipalities. Because Beaufort County has enacted no zoning ordinance, the major piece of legislation affecting development on Hilton Head Island is the Beaufort County Development Standards Ordinance (DSO), which was adopted in the fall of 1978. It replaced the Beaufort County Subdivision Regulations, which had been adopted in 1974. The DSO is not a zoning ordinance, but instead sets forth minimum construction standards and site design criteria which must be met before land can be developed. The ordinance addresses performance standards for setbacks; streets; rights of way and pavements; parking and loading; provision of utilities, drainage, planning and design certification; preservation of vegetation; erosion control; pollution and nuisance control; and open space provisions.

The DSO is no longer adequate to solve the problems created by the ongoing development of Hilton Head Island, and Beaufort County officials recognize that additional development controls are needed. As a first step in arriving at the form which such controls should take, the Beaufort County Joint Planning Commission (JPC) has almost completed work on the preparation of a comprehensive land use plan for Hilton Head Island. The plan is intended to serve as a policy statement about future development and distribution. Upon completion of the land use plan, County Council will consider available mechanisms which can be used to control and direct growth on Hilton Head.

4. NON-POINT SOURCE POLLUTION

As previously indicated in Chapter I, the control of non-point source pollution on Hilton Head is of increasing importance as development continues. Water quality studies have determined that the bacterial degradation of Lawton Creek is attributable to non-point source runoff. Few data are available to indicate the present quality of inland waters of the northern portion of the island, but it is expected that they are also susceptible to non-point runoff unless effective control programs are implemented commensurate with development.

A cooperative venture is now underway between the EPA, DHEC, and Beaufort County to develop management practices which can be implemented on Hilton Head to control non-point source pollution. This work is being funded through the Section 208 program.

The study will focus on identification of drainage patterns on the island, water quality sampling, and the control of stormwater runoff. Recommendations from this program regarding the control of non-point source pollution must be integrated with the wastewater management programs on the island in order to upgrade and preserve the quality of area waters.

PART E. WASTEWATER MANAGEMENT ALTERNATIVES

Wastewater management alternatives are presented and evaluated in this section for each of the PSD's on Hilton Head. In addition, wastewater management alternatives are presented for the Hilton Head Plantation and the non-PSD areas of the island.

1. SEA PINES PSD - FOREST BEACH PSD

The Sea Pines PSD treatment plant is owned and operated by the Sea Pines Public Service District Commission. The plant treats wastewater generated from the Sea Pines PSD and the Forest Beach PSD. The plant has an existing capacity of 2.5 million gallons per day (mgd). A portion of the treated effluent is spray irrigated onto the Club Course, the Hilton Head Golf Club, or portions of the Forest Preserve. The remainder is discharged into Lawton Canal.

At the request of the Sea Pines PSD, the South Carolina DHEC has modified Consent Order 78-84-W, as amended on December 19, 1978 to permit influent flow to the plant up to 3.25 mgd and to reduce the allowable discharge to Lawton Canal to 1.8 mgd. Previously, this Consent Order restricted flow to the plant to 2.5 mgd and limited the allowable discharge to Lawton Canal to 2.0 mgd.

The Sea Pines PSD will modify their existing treatment facilities to provide a 3.25 mgd capacity. The construction required is considered as the first phase of the PSD's ultimate plans to expand plant capacity to 5.0 mgd to meet projected needs of Sea Pines and Forest Beach. The PSD plans to irrigate the remaining three golf courses (Ocean, Sea Marsh, and Harbour Town) in Sea Pines with treated wastewater. In addition, an experimental wetlands discharge system will be implemented in the Sea Pines Forest Preserve. This system, conceived by conservationist Todd Ballentine and endorsed by the Nancy Cathcart Chapter of the Sierra Club, will involve the discharge of treated effluent into drainageways of the Sea Pines Forest Preserve as a means to restore the area's wetlands. The irrigation of all five golf courses and the wetlands experimental system, coupled with the allowable 1.8 mgd discharge into Lawton Canal, are judged to be sufficient to fully accommodate the 3.25 mgd capacity of the expanded Sea Pines PSD plant.

Projected Wastewater Flows

As previously indicated, OBERS- and JPC-based populations have been projected for the year 2000 for each service area of Hilton Head Island. Wastewater flows for the year 2000 are based upon the "peak month" population and per capita flow rates for each of the population components.

Peak monthly average flows for the year 2000 for Sea Pines PSD - Forest Beach PSD are 2.85 mgd (based upon OBERS) and 3.36 mgd (based upon JPC). By comparison, the Sea Pines PSD plans to expand its wastewater treatment facilities to an ultimate capacity of 5.0 mgd. Part of this difference can be attributed to consideration of occupancy rates. When the JPC-based year 2000, peak month population is adjusted to reflect 100 percent occupancy, a corresponding wastewater flow of 4.22 mgd results.

Description of Alternatives

Wastewater management alternatives have been formulated for Sea Pines PSD-Forest Beach PSD. Each alternative includes the 3.25 mgd Sea Pines PSD plant, irrigation of the five golf courses, and the experimental wetlands system.

Even with irrigation of all five golf courses, a substantial amount of wastewater will remain which must be handled by supplemental means. Analyses have previously been conducted of the seasonal irrigation needs of these courses

as part of this Environmental Impact Statement. Figure II-1 shows the monthly average wastewater flows projected for the year 2000 (JPC) versus the estimated seasonal golf course usage. Table II-4 presents the difference between wastewater flows and golf course irrigation quantities on a monthly average basis for both the year 2000 JPC and OBERS flows.

Supplemental disposal techniques include advanced treatment and discharge to Lawton Canal, secondary treatment and discharge to Calibogue Sound via a subaqueous outfall and diffuser, and treatment and land application either on or off the island.

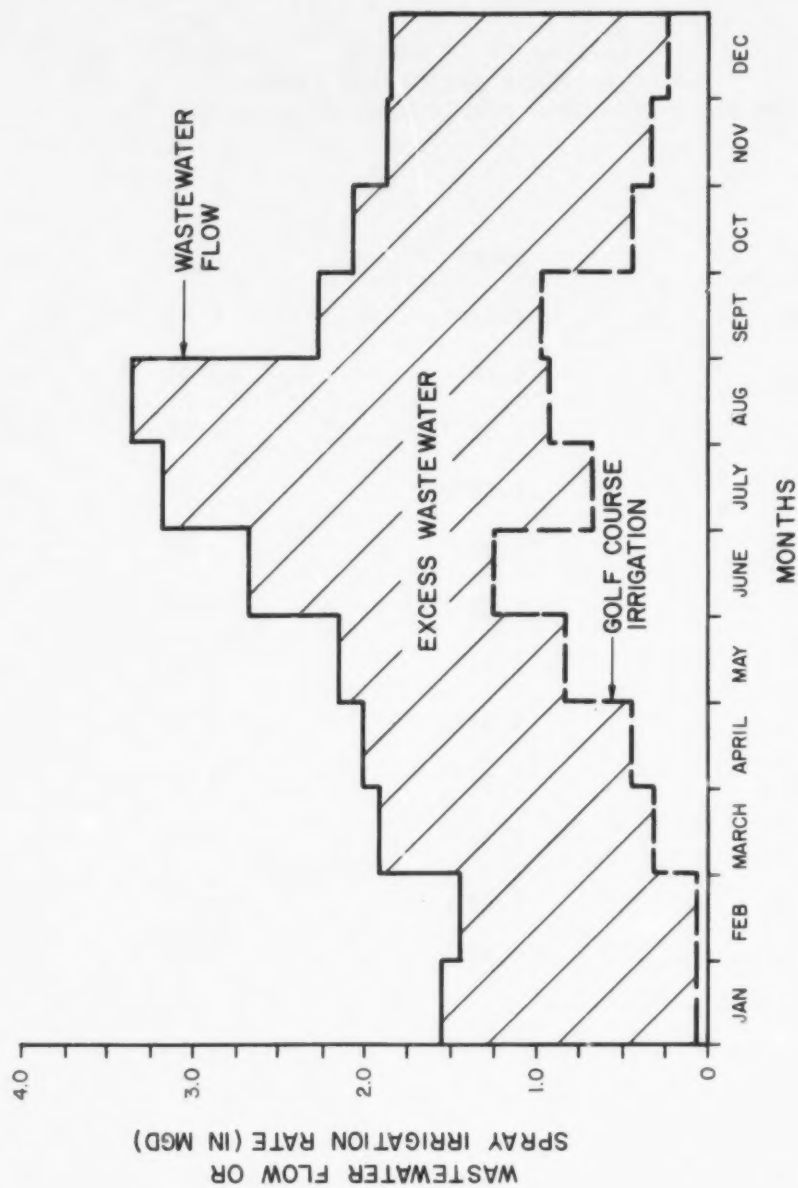
Secondary treatment and discharge to the Atlantic Ocean was eliminated from further consideration based upon comparison with the Calibogue Sound alternative. The costs for an outfall to the Atlantic Ocean are substantially greater than for an outfall to Calibogue Sound because of the relative depths of the water bodies at equal distances off-shore. Water of greater than 30-foot depth could be reached in Calibogue Sound with an underwater outfall approximately 4,000 feet long; to reach even a 20-foot depth in the Ocean would require an outfall over 15,000 feet in length and to reach a 30-foot depth would require an outfall over 26,000 feet in length. Figure II-2 shows this difference in depths very vividly. Because of the longer underwater outfall that would be required, a discharge to the Atlantic Ocean would cost approximately two to three times that for a discharge to Calibogue Sound. In addition, the Atlantic Ocean does not offer any advantages over Calibogue Sound as a point of discharge based upon its ability to receive and assimilate wastewater.

The land application schemes have been developed following the evaluation of undeveloped parcels on Hilton Head both within, and outside of, the existing boundaries of the Sea Pines PSD and the Forest Beach PSD. One scheme has been formulated to meet the possible constraint that lands outside the PSD boundaries cannot be obtained for the land application of wastewater; the other considers that land outside the PSD boundaries can be obtained. In addition, land application at a site off the island has also been considered.

Descriptions of each alternative are provided in the following sections.

Lawton Canal Discharge - This alternative involves the discharge of advanced-treated wastewater to Lawton Canal as a supplement to irrigation of the five golf courses. Sand filters would be constructed at the 3.25 mgd plant proposed by the Sea Pines PSD in order to achieve the effluent quality required by DHEC. The experimental wetlands discharge system would be utilized to the extent possible as a back-up system. Figure II-3 provides a schematic representation of this alternative.

Calibogue Sound Discharge - This alternative involves the discharge of secondary-treated wastewater to Calibogue Sound through a subaqueous outfall and diffuser as a supplement to irrigation of the five golf courses. Again, the experimental wetlands discharge system would be utilized to the extent possible as a back-up system. Figure II-4 presents a schematic representation of this alternative.



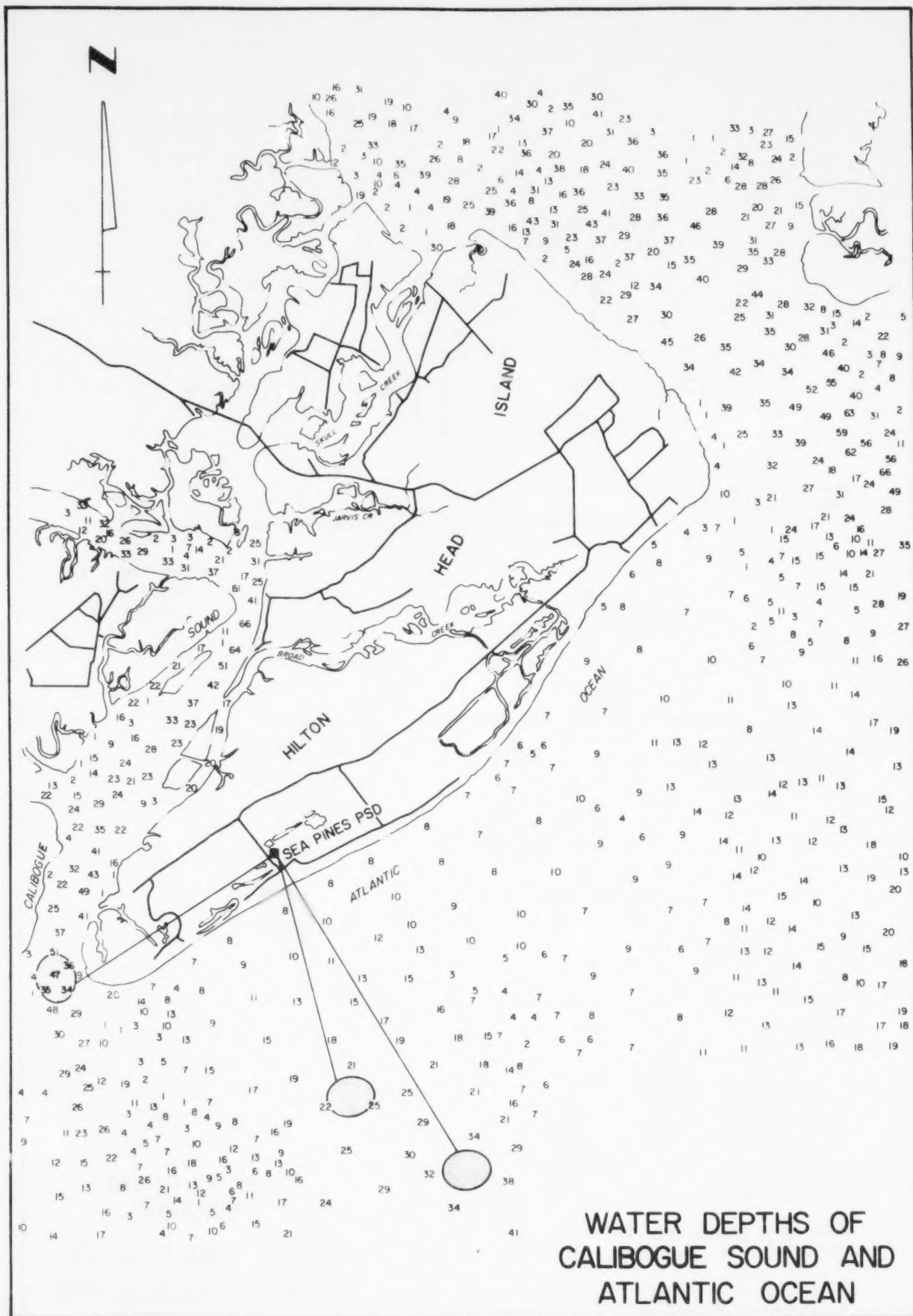
WASTEWATER FLOW VS.
IRRIGATION CAPACITY
SEA PINES PSD -
FOREST BEACH PSD

II-17a

FIGURE II-1

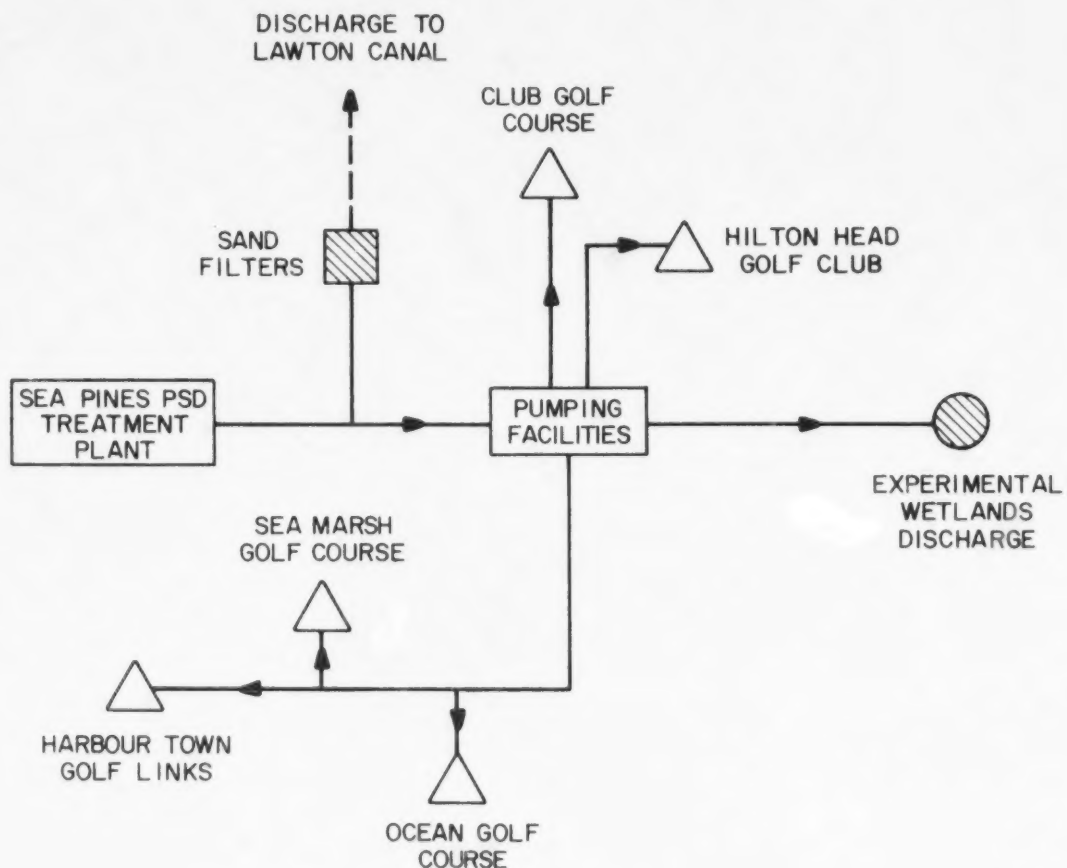
TABLE II-4
WASTEWATER IN EXCESS
OF GOLF COURSE IRRIGATION NEEDS
FOR SEA PINES PSD - FOREST BEACH PSD, in mgd

<u>Month</u>	<u>OBERS</u>	<u>JPC</u>
January	1.23	1.47
February	1.15	1.37
March	1.32	1.61
April	1.34	1.66
May	1.01	1.34
June	1.03	1.44
July	2.03	2.51
August	2.04	2.55
September	1.04	1.38
October	1.32	1.63
November	1.28	1.56
December	1.35	1.63



4-18a

FIGURE II-2



LEGEND

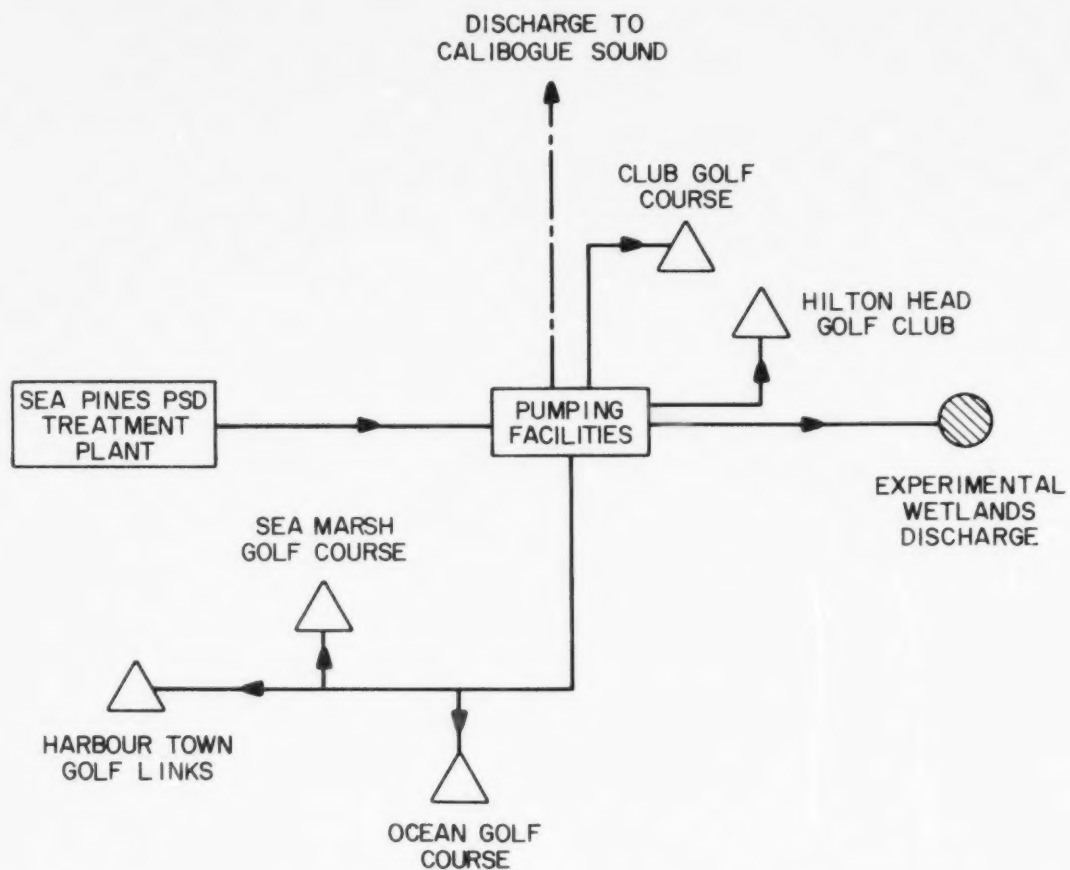
-  PROPOSED SAND FILTERS
-  GOLF COURSE IRRIGATION
-  PROPOSED EXPERIMENTAL WETLANDS DISCHARGE
-  PROPOSED DISCHARGE

LAWTON CANAL
DISCHARGE

SEA PINES PSD-
FOREST BEACH PSD

II-18p

FIGURE II - 3



LEGEND

-  GOLF COURSE IRRIGATION
-  PROPOSED EXPERIMENTAL WETLANDS DISCHARGE
-  PROPOSED OUTFALL

CALIBOGUE SOUND
DISCHARGE

SEA PINES PSD-
FOREST BEACH PSD

FIGURE II-4

11/8c

The outfall to Calibogue Sound would be routed from the Sea Pines plant southward along Sea Pines Drive and then across South Beach. Detailed studies would be necessary to determine the optimal location and orientation of the diffuser in order to ensure maximum mixing and dispersion of the effluent.

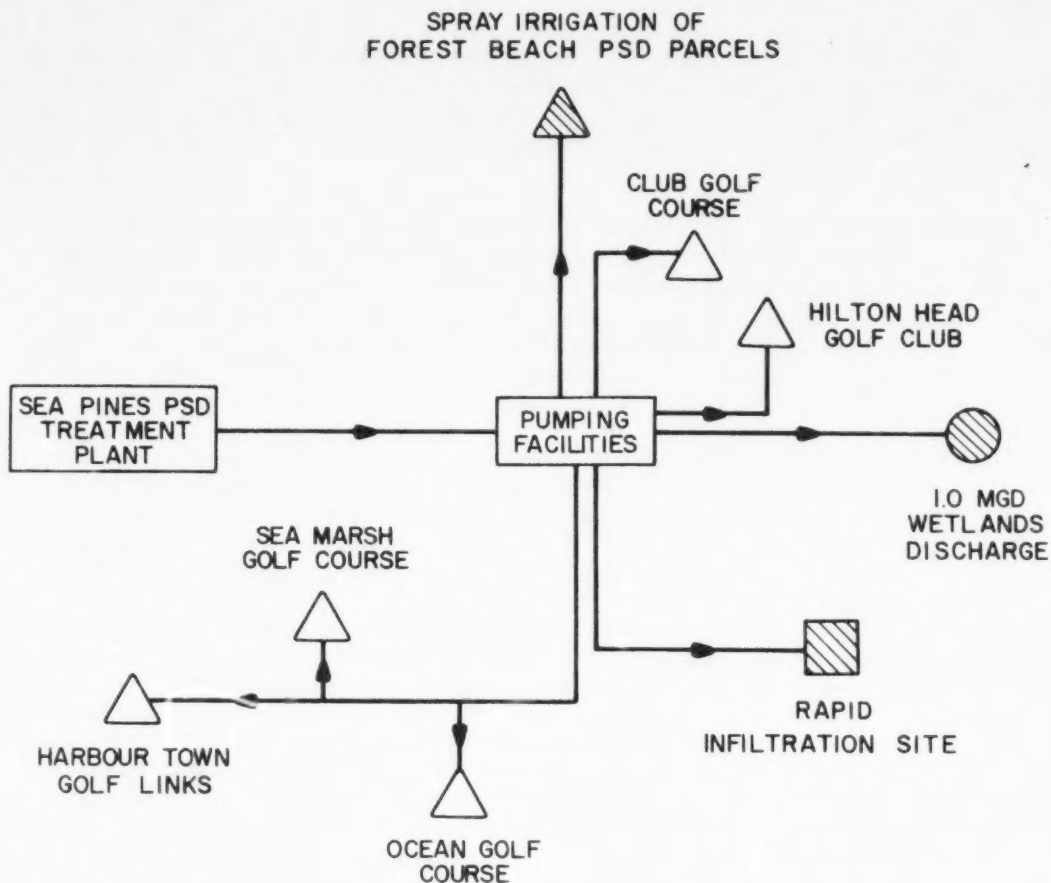
Rapid Infiltration - This alternative utilizes a combination of rapid infiltration, woodlands irrigation, and wetlands discharge within the Forest Preserve to provide for the complete disposal of the wastewater quantities which are not used by the five golf courses. Figure II-5 provides a schematic representation of this alternative.

Table II-5 presents the amount of wastewater which must be handled by each of the disposal techniques in order to provide a workable alternative. If either wetlands discharge or rapid infiltration cannot reliably handle the indicated rate of application, then the other must accommodate the difference. If both wetlands discharge and rapid infiltration cannot reliably handle their respective rates of application, there is insufficient suitable land within the PSD's for woodlands irrigation to take up the slack.

The woodlands irrigation scheme involves the application of treated wastewater onto wooded parcels which lie within the Forest Beach PSD along its boundary with the Broad Creek PSD and immediately adjacent to the Hilton Head Golf Club. These parcels have an estimated usable area of approximately 32 acres. At an application rate of 2 inches per week, approximately 0.25 mgd could be applied. A solid-set spray irrigation system would be used to apply wastewater to these woodland areas in order to reduce alteration of the natural habitat. Wastewater would be pumped to the sites from the Sea Pines PSD plant via force main along Pope Avenue and up Route 278.

As indicated in a recent report prepared for the Sea Pines PSD, a site within the Sea Pines Forest Preserve adjacent to the Sea Pines PSD plant is the best site available for construction of a rapid infiltration system. This area is presently wooded and construction of a rapid infiltration system would require extensive clearing and site alteration. Approximately 12 acres of bed area would be required to dispose of 1.3 mgd at an application rate of 25 inches per week. Dual beds would be required so that application could be alternated between the two. Because of the concerns over possible nitrate contamination of groundwater, an intensive monitoring program would be required so that nitrogen movement and transformation through the soil profile could be ascertained. Evidence of groundwater contamination would require lower application rates and/or total nitrogen removal at the Sea Pines PSD plant.

The wetlands discharge system holds exceptional promise as a means to dispose of treated wastewater. However, it is not possible to determine the amount of treated wastewater which can be absorbed within the Forest Preserve except through actual operation and monitoring of the system.



LEGEND

-  GOLF COURSE IRRIGATION
-  PROPOSED SPRAY IRRIGATION SITE
-  PROPOSED RAPID INFILTRATION SITE
-  PROPOSED WETLANDS DISCHARGE

RAPID INFILTRATION
ALTERNATIVE

SEA PINES PSD-
FOREST BEACH PSD

TABLE II-5
SEA PINES PSD - FOREST BEACH PSD
LAND APPLICATION CAPACITIES FOR DISPOSAL COMPONENTS
OF RAPID INFILTRATION ALTERNATIVE

Component	Capacity in mgd	
	Low	High
Wetlands application into Sea Pines Forest Preserve	1.0 (1)	1.0 (1)
Woodlands irrigation of Forest Beach PSD parcels	0.25 (2)	0.5 (3)
Rapid infiltration at site between Sea Pines PSD plant and Waterfowl Pond in Sea Pines Forest Preserve	1.3 (4)	1.3 (5)
Total	2.55	2.8

- (1) Must accommodate 1.0 mgd to provide workable alternative. Amount of treated wastewater which can be absorbed within Preserve can only be determined through actual operation and monitoring of the system.
- (2) Based upon application rate of 2 inches per week.
- (3) Based upon application rate of 4 inches per week.
- (4) Based upon application rate of 25 inches per week.
- (5) Physical expansion of rapid infiltration system constrained by site limitations. Increased capacity can be achieved only by sustained application rates in excess of 25 inches per week.

Spray Irrigation On-Island - This alternative provides for the disposal of wastewater quantities which are not used by the five golf courses totally by spray irrigation on a single large tract outside the boundaries of the PSD's. The experimental wetlands discharge system would be utilized to the extent possible as a back-up system. Figure II-6 provides a schematic representation of this alternative.

Of the undeveloped land parcels on Hilton Head, the Gardner-Matthews tract (Parcel 1 on Beaufort County Tax Map 11) has been identified as most suitable for land application of treated wastewater. This parcel has a total area of nearly 1,000 acres; almost 40 percent of the parcel is composed of the well-drained Wando soils which are generally located in the center of the parcel. The Otter Hole Trailer Park and a 15-acre residential property lie within the tract.

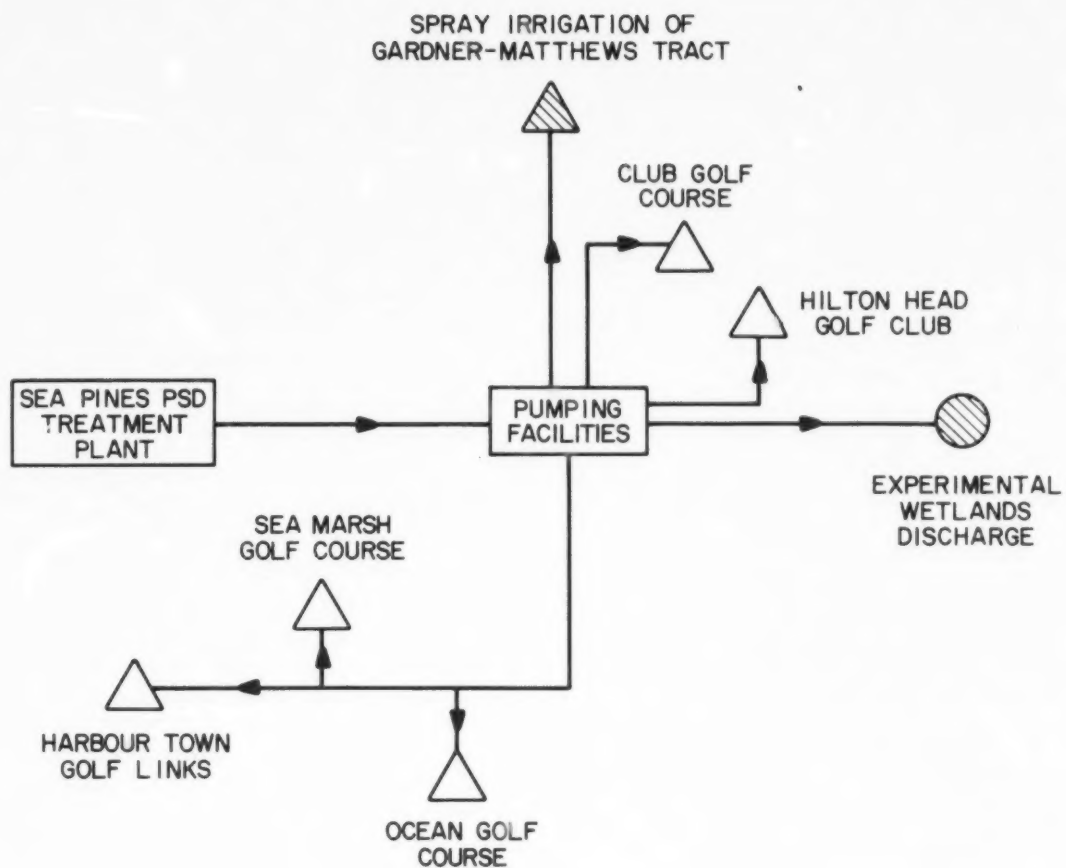
It is estimated that approximately 600 acres are suitable for slow-rate irrigation. As shown in Table II-6, this available area far exceeds the land required to irrigate the 2.55 mgd increment (based on JPC projections) from the Sea Pines PSD and the Forest Beach PSD that cannot be handled by golf course irrigation. This additional area would be available to accommodate the expansion of the irrigation system should wastewater flows from Sea Pines PSD - Forest Beach PSD exceed the JPC projections. The area could also serve as a spray irrigation area for the other PSD's on the island (e.g., Broad Creek PSD and Hilton Head No. 1 PSD) should their flows exceed JPC projections. Portions of the tract peripheral to the spray areas could be utilized for public recreation and dedicated open space.

A solid-set spray irrigation system would be used to apply wastewater to this area in order to preserve the natural habitat. Wastewater would be pumped from the Sea Pines PSD plant via Pope Avenue, Route 278, Matthews Drive, and Marshland Road. A topographic and vegetative survey is required in order to identify those portions of the parcel most suitable for irrigation. Monitoring would be required to determine forest responses, wildlife responses and groundwater impacts from the system.

Spray Irrigation Off-Island - This alternative provides for the disposal of wastewater quantities which are not used by the five golf courses totally by spray irrigation on large tracts of land off the island including the crossing of Skull Creek and Mackay Creek either with an underwater pipeline or pipe suspended from the bridges. Again, the experimental wetlands discharge system would be utilized to the extent possible as a back-up system. Figure II-7 provides a schematic representation of this alternative.

Three general areas on the mainland have been identified as potential spray sites, based upon soils characteristics. These areas are Union Camp property in the Bluffton area, contiguous parcels in the Sawmill Creek area, and contiguous parcels south of Route 278 generally across from Moss Creek Plantation. These general areas are shown in Plate II-3.

Costs were developed for each of these off-island alternatives based upon the purchase of land at \$5,000 per acre. Using this assumption, the costs vary within a 10 percent range dependent upon the distance of the spray



II-2/a

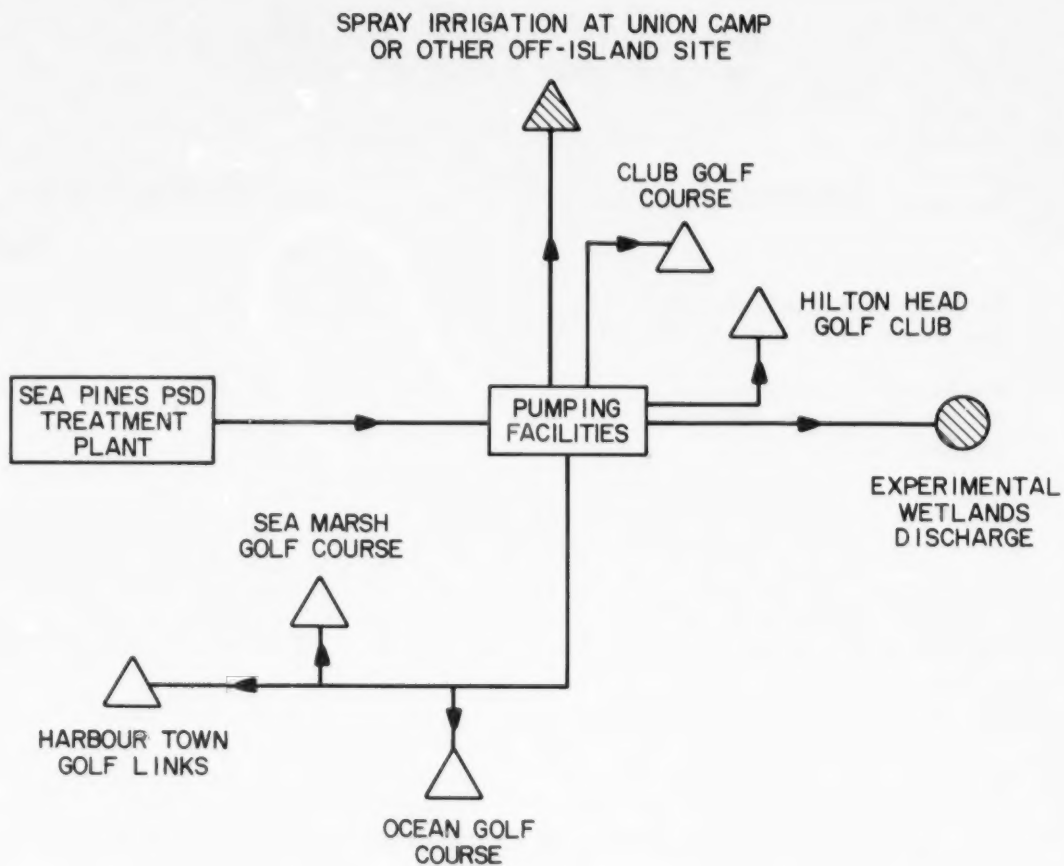
FIGURE II-6

TABLE II-6

SEA PINES PSD - FOREST BEACH PSD
LAND APPLICATION CAPACITIES FOR DISPOSAL BY
ON-ISLAND SPRAY IRRIGATION ALTERNATIVE

<u>Component</u>	<u>Capacity in mgd</u>	
	<u>Low</u>	<u>High</u>
Wetlands application into Sea Pines Forest Preserve	-- (1)	-- (1)
Woodlands irrigation of Gardner-Matthews tract (Parcel 11-1)	2.55 (2)	5.0 (3)
Total	2.55	5.0

- (1) Wetlands application will be utilized to the extent possible as a back-up system.
- (2) Based upon application rate of 2 inches per week over approximately 300 acres.
- (3) Based upon application rate of 2 inches per week over entire usable area of tract. Total usable area estimated to be 600 acres.



LEGEND



GOLF COURSE
IRRIGATION



PROPOSED SPRAY
IRRIGATION SITE



PROPOSED EXPERIMENTAL
WETLANDS DISCHARGE

SPRAY IRRIGATION
OFF-ISLAND

SEA PINES PSD -
FOREST BEACH PSD



SPRING ISLAND

COLLETON

SAWMILL CREEK

PINCKNEY COLONY RD.

U.S.

ROUTE

S.C.

AREA



PORT

ROYAL

SOUND

RIVER

SAWMILL

CREEK

SAWMILL

CREEK

AREA

ROUTE

278

S.C.

BURNT

MOSS

CREEK

PLANTATION

BUCKINGHAM
LANDING

CREEK

MACKAY

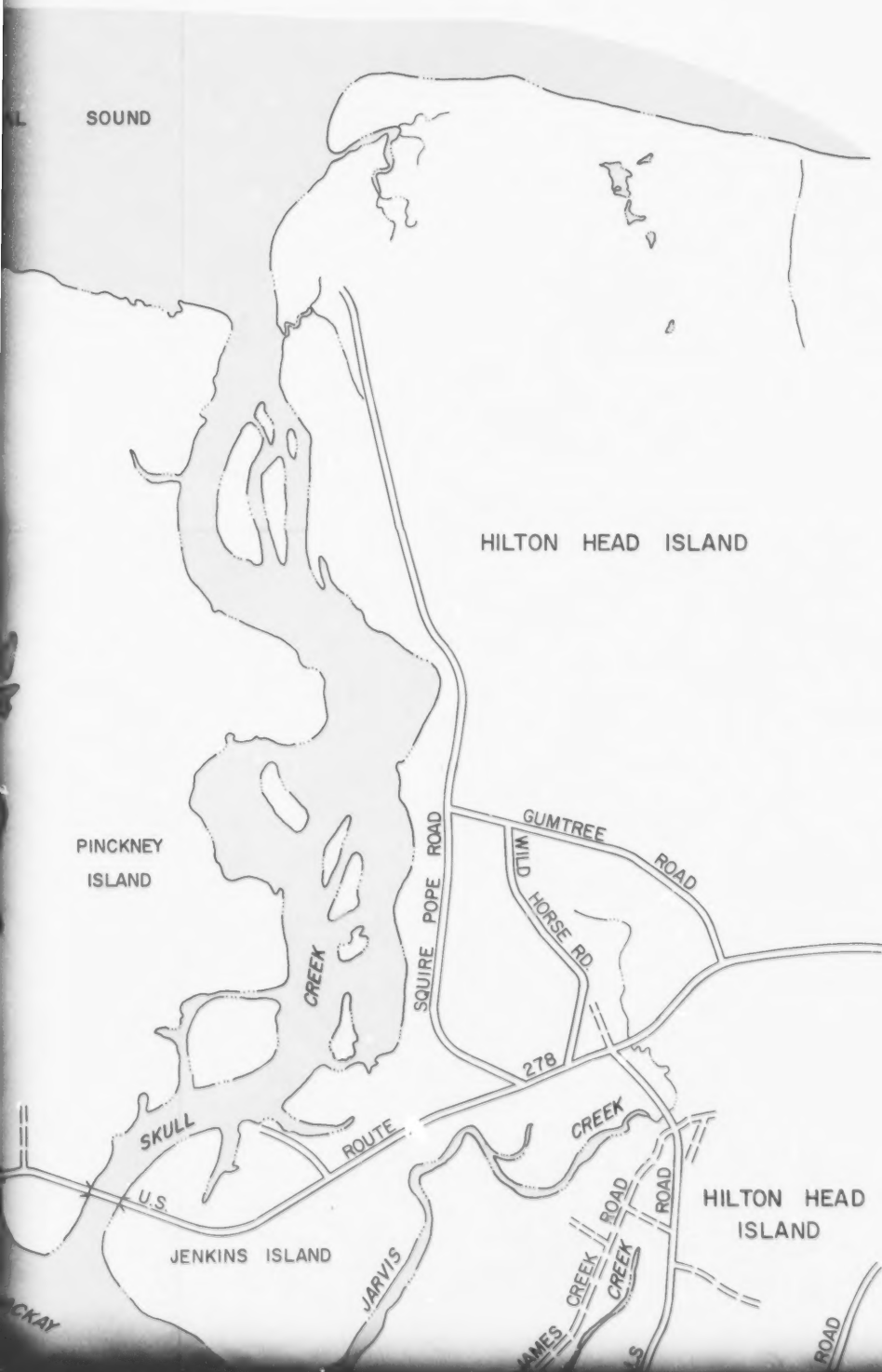
PINCKNEY
ISLAND

SKULL

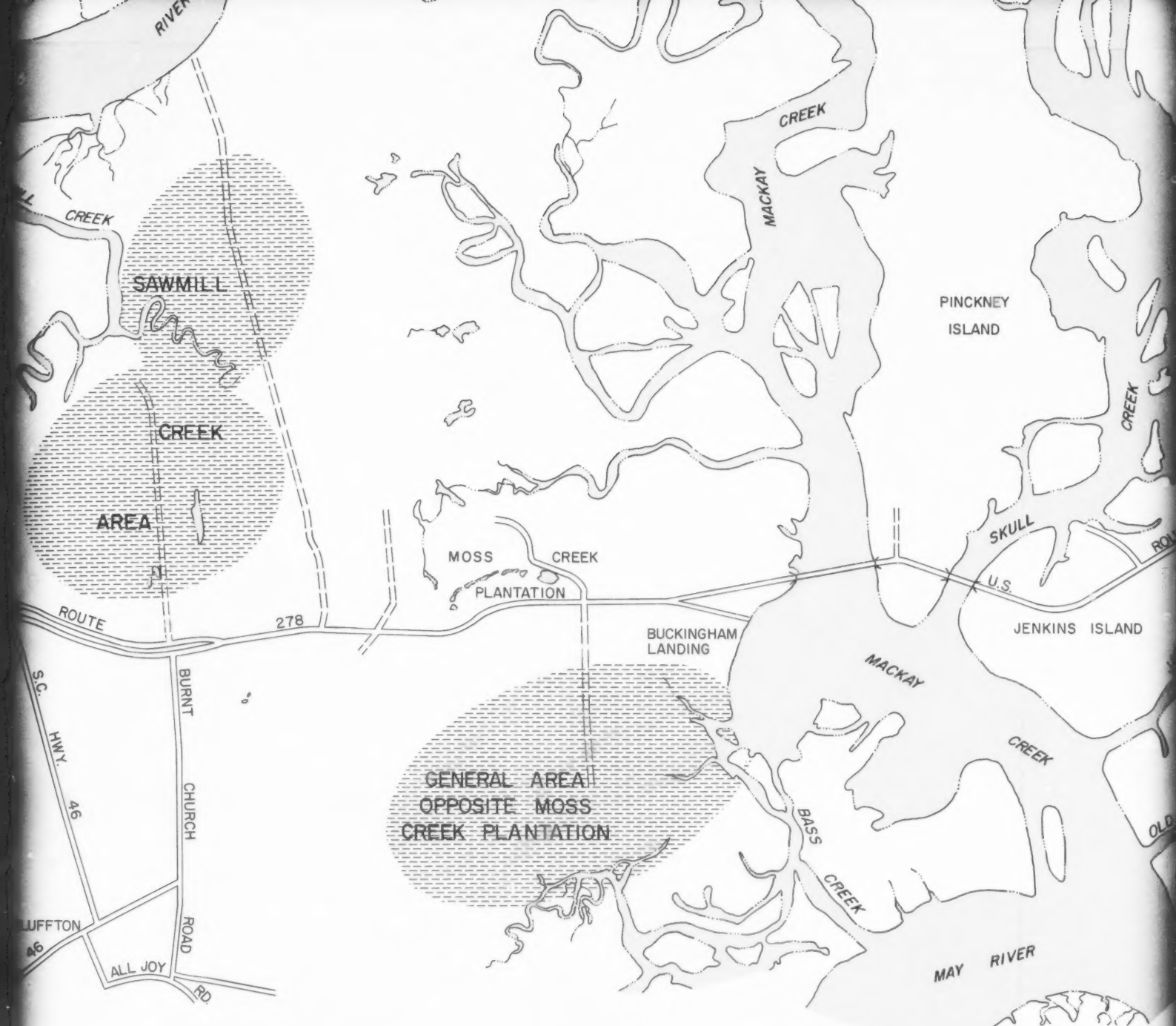
U.S.

JENKINS IS.

MACKAY







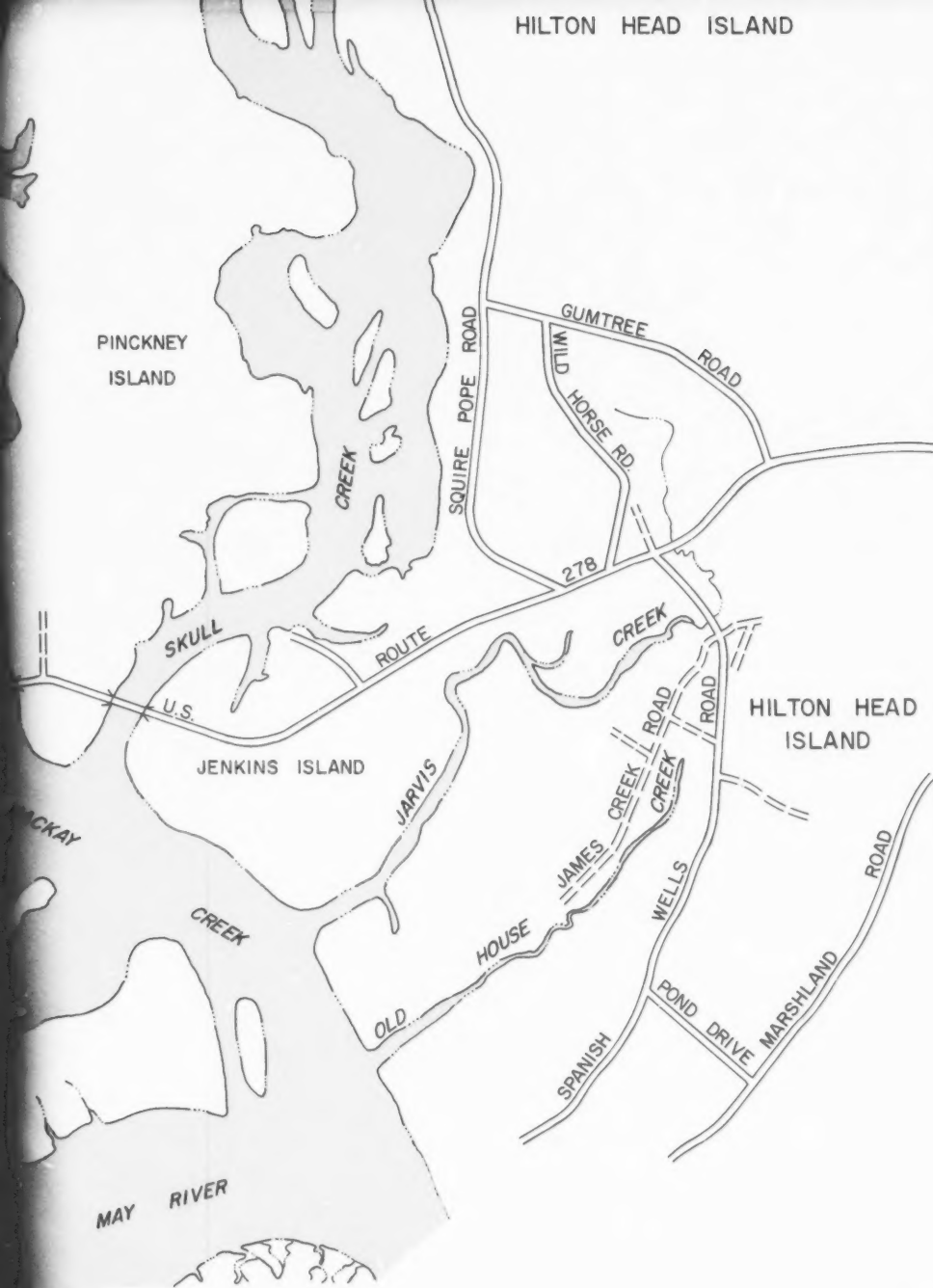


PLATE II - 3

HILTON HEAD ISLAND
SOUTH CAROLINA

OFF-ISLAND SPRAY
IRRIGATION AREAS



SCALE IN FEET

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION IV ATLANTA, GEORGIA

site from the Sea Pines PSD treatment plant. The Union Camp site is most costly because of its greater distance from Sea Pines; lesser land costs or the negotiation of a cooperative, long-term arrangement with Union Camp (with Union Camp using treated wastewater to promote timber production) would make this site more attractive.

No-Federal Action Alternative - A requirement of the EIS process developed by EPA is that a no-action alternative will be considered along with other wastewater facilities alternatives. The no-action alternative implies that no Federal funding would be available for wastewater facilities on Hilton Head. Under this alternative, improvement and/or expansion of the wastewater facilities would be required but there would be no Federal funds provided for design and construction of the facilities.

In the event that EPA decides not to fund additional wastewater facilities for the Sea Pines PSD - Forest Beach PSD, it is expected that expanded treatment and disposal capacity will be provided by the private sector in order to accommodate continued development. In fact, the planned expansion of the Sea Pines PSD plant to 3.25 mgd, the irrigation of the Ocean, Sea Marsh, and Harbour Town golf courses with wastewater, and the experimental wetlands discharge system are being funded totally at the local level in order to relieve constraints on development.

Cost Evaluation

A detailed evaluation of all significant cost components of the alternative wastewater management systems is required in order to perform the comparative cost analyses. Construction, project, and operation and maintenance costs are developed for each management system for incorporation into a net present worth cost analysis. The present worth cost analysis establishes a basis for comparison of total costs (capital and annual operations costs) for each of the wastewater management alternatives. These total costs include the Federal share of the costs associated with construction grants. Comparative cost analysis (either present worth or equivalent annual cost) is an EPA requirement in performing the cost effectiveness analysis and serves as the primary cost evaluation criterion according to EPA guidelines.

Cost Development - A detailed evaluation of all significant cost components of the alternative wastewater management systems is required in order to perform the comparative cost analyses. Construction, project, and operation and maintenance costs have been developed for each management system based upon appropriate costing documents published by EPA. All costs have been

trended to 1980 price levels in the Hilton Head area. Unless otherwise noted, certain facilities have been excluded from the costing because they are common to each of the five alternatives. These include facilities associated with the planned expansion of the Sea Pines plant to 3.25 mgd, irrigation of the five golf courses, and the experimental wetlands discharge system (except for the Rapid Infiltration Alternative).

Present Worth Analysis - The present worth analysis establishes a total cost value of the capital expenditures and operating costs of each alternative over the duration of the planning period. The present worths for the wastewater management alternatives are developed for a 15-year planning period ending in the year 2000 using an interest rate of 7.125 percent. In accordance with EPA guidelines, allowances are made for salvage values at the end of the planning period.

Tables II-7, II-8, II-9, II-10, and II-11 provide cost breakdowns for the five alternatives for Sea Pines PSD - Forest Beach PSD based upon the JPC flows. Table II-12 provides a comparative summary of the costs of each alternative. As shown in the table, spray irrigation off-island at Union Camp is approximately equal in cost to spray irrigation on-island at Gardner-Matthews based upon purchase of land at \$5,000 per acre and \$15,000 per acre respectively.

Alternatives which involve the discharge of treated wastewater into either Lawton Canal or Calibogue Sound are substantially lower in cost than alternatives which involve the purchase of land for a new spray irrigation site to supplement golf course irrigation. The costs for discharge alternatives range from approximately 15 to 25 percent of the costs for the land application alternatives.

Operability Evaluation

Evaluation of operability of wastewater management alternatives should include consideration of the following aspects:

- . reliability of treatment/disposal
- . flexibility of operation
- . maintainability of facilities

In the evaluation of reliability the ability of the facilities in the treatment schemes to maintain the intended treatment levels is considered as well as the reliability of the method used to dispose of the treated wastewater. Operational flexibility is a measure of the ability of wastewater treatment components to adapt to changes in wastewater characteristics and the ability of the wastewater management system to serve future development areas and to undergo upgrading and/or expansion to comply with changes in water quality goals. Maintainability considerations include the complexity of equipment, frequency of maintenance down time, and efficiency of providing required maintenance.

TABLE II-7

COST SUMMARY FOR 2.55 MGD DISCHARGE FROM
SEA PINES PSD - FOREST BEACH PSD TO LAWTON CANAL (1)

Component	Project Costs(2)	Land Costs	Salvage Value	Annual O & M	EAC
Discharge To Lawton Creek					
Sand Filters - Dual Units @ 2.55 mgd	1,777,284	---	710,914	37,409	
Total	\$1,777,284	---	\$ 710,914	\$ 37,409	\$206,100

(1) All costs in 1985 present worth based upon 15-year planning period ending in the year 2000, 7.125 percent interest and 1980 price levels. Capacities based upon JPC flows.

(2) Includes a 30-percent allowance for engineering, financing, and contingencies.

TABLE II-8
COST SUMMARY FOR 2.55 MGD DISCHARGE FROM
SEA PINES PSD - FOREST BEACH PSD TO CALIBOGUE SOUND (1)

Component	Project Costs(2)	Land Costs	Salvage Value	Annual O & M	EAC
<u>Discharge To Calibogue Sound</u>					
. Pumping - 2.55 mgd	138,858	---	50,202	15,652	
. Force Main - 18,500 Ft. @ 14" Dia.	921,023	---	481,766	1,552	
. Subaqueous Outfall - 4,000 Ft. @ 14" Dia. and Diffuser Structure	973,978	---	509,466	---	
Total	\$2,033,864	---	\$1,041,434	\$17,204	\$201,300

(1) All costs in 1985 present worth based upon 15-year planning period ending in the year 2000, 7.125 percent interest and 1980 price levels. Capacities based upon JPC flows.

(2) Includes a 30-percent allowance for engineering, financing, and contingencies.

TABLE II-9

COST SUMMARY FOR 2.55 MGD DISCHARGE FROM
SEA PINES PSD - FOREST BEACH PSD BY RAPID INFILTRATION (1)

Component	Project Costs(2)	Land Costs(3)	Salvage Value	Annual O & M	EAC
<u>Wetlands Application</u>					
• Pumping - 1.0 mgd	101,088	--	36,547	11,664	
• Force Main - 12,000 Ft @ 10" Dia.	361,928	--	172,278	685	
• Diffusers - 6,000 Ft @ 4" Dia.	36,000	--	17,136	342	
<u>Woodlands Irrigation</u>					
• Pumping - 0.25 mgd	84,240	--	30,456	10,368	
• Force Main - 25,500 Ft @ 6" Dia.	535,500	--	254,898	1,191	
• Solid-set Spray Irrigation System	215,280	5,275,050(4)	4,587,000	7,419	
<u>Rapid Infiltration</u>					
• Pumping - 1.3 mgd	102,960	--	37,224	11,952	
• Force Main - 1,500 Ft @ 10" Dia.	45,000	--	21,420	92	
• Infiltration Beds	484,380	621,000(5)	--	37,260	
Total	\$1,966,376	\$5,896,050	\$5,156,959	\$80,973	\$748,000

- (1) All costs in 1985 present worth based upon 15-year planning period ending in the year 2000, 7.125 percent interest and 1980 price levels. Capacities based upon JPC flow.
- (2) Includes a 30-percent allowance for engineering, financing, and contingencies.
- (3) Includes a 15-percent allowance for administrative and legal costs.
- (4) Based upon purchase of Parcels 15-317, 15-314, 15-258, and 15-163 in their entirety to yield net usable area of approximately 32 acres.
- (5) Based upon total area of 18 acres to provide for 12 acres of bed area. Costs taken at \$30,000 per acre from Wilbur Smith & Associates report prepared for Sea Pines PSD.

TABLE II-10

COST SUMMARY FOR 2.55 MGD DISCHARGE FROM
SEA PINES PSD - FOREST BEACH PSD BY SPRAY IRRIGATION ON-ISLAND AT GARDNER-MATTHEWS (1)

Component	Project Costs(2)	Land Costs(3)	Salvage Value	Annual O & M	EAC
<u>Woodlands Irrigation</u>					
• Pumping - 2.55 mgd	138,858	---	50,202	15,652	
• Force Main - 54,000 Ft. @ 16" Dia.	3,061,800	---	1,457,417	3,866	
• Solid Set Spray Irrigation System	2,664,090	8,625,000(4)	7,500,000	81,893	
• Storage - 23 Million Gallons	300,993	138,000(5)	120,000	1,714	
Total	\$6,165,741	\$8,763,000	\$9,127,619	\$103,125	\$1,395,826

- (1) All costs in 1985 present worth based upon 15-year planning period ending in the year 2000, 7.125 percent interest, and 1980 price levels. Capacities based upon JPC flows.
- (2) Includes a 30-percent allowance for engineering, financing and contingencies.
- (3) Includes a 15-percent allowance for administrative and legal costs.
- (4) Based upon purchase of 500 acres within Parcel 11-1 to provide for spray area of approximately 305 acres plus adequate buffer area @ \$15,000 per acre.
- (5) Based upon purchase of 8 acres within Parcel 11-1 for storage pond.

TABLE II-11

COST SUMMARY FOR 2.55 MGD DISCHARGE FROM
SEA PINES PSD - FOREST BEACH PSD BY SPRAY IRRIGATION OFF-ISLAND AT UNION CAMP (1)

Component	Project Costs(2)	Land Costs(3)	Salvage Value	Annual O & M	EAC
Pumping - 2.55 mgd	138,858	---	50,202	15,652	
Booster - 2.55 mgd	138,858	---	50,202	15,652	
Land Based Force Main - 113,900 Ft. @ 16" Dia.	6,458,130	---	3,378,099	8,154	
Subaqueous Force Main - 9,000 Ft. @ 16" Dia.	1,205,100	---	630,360	644	
Solid Set Spray Irrigation System	2,664,090	2,875,000(4)	2,500,000	81,893	
Storage - 23 Million Gallons	300,993	46,000(5)	40,000	1,714	
Total	\$10,906,029	\$2,921,000	\$6,648,863	\$123,709	\$1,392,174

- (1) All costs in 1985 present worth based upon 15-year planning period ending in the year 2000, 7.125 percent interest, and 1980 price levels. Capacities based upon JPC flows.
- (2) Includes a 30-percent allowance for engineering, financing and contingencies.
- (3) Includes a 15-percent allowance for administrative and legal costs.
- (4) Based upon purchase of 500 acres from Union Camp to provide spray area of approximately 305 acres @ \$5,000 per acre.
- (5) Based upon purchase of 8 acres for storage pond.

TABLE II-12
COST SUMMARY FOR SEA PINES PSD - FOREST BEACH PSD
WASTEWATER MANAGEMENT ALTERNATIVES (1)

Alternative	Construction Cost	Project Cost	Salvage Value	O & M Cost 1985	O & M Cost 2000	O & M Present Worth	Total Present Worth	EAC
Lawton Canal	\$ 1,367,200	\$ 1,777,300	\$ 710,900	\$27,300	\$ 37,400	\$ 337,800	\$ 1,861,900	\$ 206,100
Calibogue Sound	\$ 1,564,500	\$ 2,033,900	\$1,041,400	\$12,600	\$ 17,200	\$ 155,400	\$ 1,818,300	\$ 201,300
Rapid Infiltration	\$ 6,639,700	\$ 7,862,400	\$5,157,000	\$59,100	\$ 81,000	\$ 731,500	\$ 6,757,000	\$ 748,000
Spray Irrigation On-Island	\$12,362,900	\$14,928,700	\$9,127,600	\$75,300	\$103,100	\$ 931,600	\$12,609,000	\$1,395,800
Spray Irrigation Off-Island	\$10,929,300	\$13,827,000	\$6,648,900	\$90,300	\$123,700	\$1,117,400	\$12,576,100	\$1,392,200

(1) All costs in 1985 Present Worth based upon 15-year planning period ending in the year 2000, 7.125 percent interest and 1980 price levels. Based on JPC flows with 2.55 MGD disposed by the various alternatives.

The relative operability of the alternatives is summarized in Table II-13. On an overall basis, discharge to Calibogue Sound as a supplement to golf course irrigation is the most operable. Next is discharge to Lawton Canal. Spray irrigation is next, and rapid infiltration is least operable. Certain general conclusions can be drawn from the operability evaluation as follows:

- Facilities with lower treatment levels are easier to maintain than those with higher treatment levels.
- Spray irrigation of effluent is less reliable and less maintainable than discharge to surface waters. (This evaluation is based, in part, on the operational unknowns associated with the soils and topographic conditions at potential land application sites).
- Rapid infiltration is less reliable and less maintainable than spray irrigation. This evaluation is based, in part, on the potential for groundwater contamination and the possible requirement for additional nitrogen removal at the Sea Pines PSD plant (Based upon studies performed for the Sea Pines PSD by Wilbur Smith & Associates and preliminary indications from DHEC, rapid infiltration is less desirable than other disposal options available to the Sea Pines PSD - Forest Beach PSD).

Implementability Evaluation

The practicalities of implementing a specific wastewater management plan must be considered, together with cost, environmental impacts and operability evaluations, as an important part of the cost-effectiveness analysis. The purpose of the implementability rating is to assess the prospects for successful implementation of an alternative based on its potential for general public acceptance and political realities in the study area.

Unlike the other evaluations in the cost-effectiveness analysis (costs, environmental impacts, and operability), the implementability rating is not independent, but is somewhat dependent on the results of the other evaluations. This is especially the case with public acceptance since costs and environmental impacts evaluations probably have the greatest influence on public acceptability. For example, if an environmentally favorable plan is significantly more costly, the public must decide how much it is willing to pay (in terms of monetary costs) for environmental benefits.

TABLE II-13

SEA PINES PSD - FOREST BEACH PSD
WASTEWATER MANAGEMENT ALTERNATIVES
OPERABILITY EVALUATION

<u>Alternative</u>	<u>Reliability</u>	<u>Flexibility</u>	<u>Maintainability</u>	<u>Overall Operability</u>
Discharge to Lawton Canal	0	0	0	0
Discharge to Calibogue Sound	+	+	+	+
Rapid Infiltration	-	-	-	-
Spray Irrigation On-Island	0	0	-	0
Spray Irrigation Off-Island	0	0	-	0

+ Indicates decided advantage

0 Indicates no particular advantage

- Indicates possible disadvantage or drawback

An important factor in public acceptance is the local annual cost associated with a wastewater management alternative. The local annual cost includes annual operation and maintenance costs plus the annualized local share of the cost of constructing the wastewater facilities. This is a measure of annual revenue requirements, and therefore, the actual cost to the users. Table II-14 presents a breakdown of estimated annual costs for each of the five alternatives based on the JPC-based flow. The assumptions for developing these local annual costs are as follows:

- EPA will only fund wastewater facilities sized to handle the 1.8 mgd now being discharged to Lawton Canal. Wastewater facilities required for additional flows will be funded at the local level.
- Eligible costs for EPA funding equal 90 percent of the project cost.
- Spray irrigation, rapid infiltration, and wetlands discharge including land costs are eligible for 85 percent funding.

The associated financial impacts of each alternative have also been evaluated. Estimated annual user charges have been determined as a general indication of the cost difference to the user. User charges are developed as follows:

$$\text{User charges} = \frac{\text{Annual Local Costs}}{\text{Number of EDU's}}$$

EDU's represent the average residential user. Other users such as commercial and industrial may be represented in terms of number of EDU's. EDU's are based upon the total water consumption divided by estimated typical dwelling unit consumption. For the Sea Pines PSD - Forest Beach PSD, the number of EDU's is taken at 7,810 for the year 1985 (initial year of operation for the selected alternative). This is equal to an interpolated JPC-based flow of 2.5 mgd divided by 320 gpd per EDU.

Table II-14 presents the estimated annual user charge for each of the five alternatives. These estimated charges are in addition to the charges presently being paid.

The relative implementability of the alternatives is summarized below. None of the alternatives has a decided advantage; instead, there are distinct drawbacks for each. Several general conclusions can be drawn from the implementability evaluation as follows:

- Discharge to surface waters is less acceptable to some regulatory agencies than spray irrigation on large tracts of land. The issuance of the required NPDES and Coastal Council Permits will therefore likely be very time-consuming due to administrative procedures of affected regulatory agencies.

TABLE II-14

LOCAL ANNUAL COST SUMMARY FOR
SEA PINES PSD - FOREST BEACH PSD
WASTEWATER MANAGEMENT ALTERNATIVES

Alternative	JPC Project Cost(1)	Assumed EPA Grant(2)	Local Share	Annual Debt Service(3)	Annual O & M(4)	Total Annual Cost	Annual User Charge(5)
Lawton Canal	\$ 1,777,300	\$ 1,038,200	\$ 739,100	\$110,900	\$ 27,300	\$138,200	\$ 17.70
Calibogue Sound	\$ 2,033,900	\$ 1,246,100	\$ 787,800	\$118,200	\$ 12,600	\$130,800	\$ 16.75
Rapid Infiltration	\$ 7,862,400	\$ 5,746,100	\$2,116,300	\$317,600	\$ 59,100	\$376,700	\$ 48.23
Spray Irrigation On-Island @ Gardner-Matthews	\$14,928,700	\$ 9,328,000	\$5,600,700	\$840,500	\$ 75,300	\$915,800	\$117.26
Spray Irrigation Off-Island @ Union Camp	\$15,827,000	\$ 8,777,400	\$5,049,600	\$757,800	\$ 90,300	\$848,100	\$108.59

(1) Taken from Table II-12 of PDEIS.

(2) Based on 75 percent funding for Lawton Canal and Calibogue Sound Alternatives, and 85 percent funding for Land Application Alternatives of eligible cost. Eligible cost assumed to equal 90 percent of cost for facilities sized to handle 1.8 mgd now being discharged to Lawton Canal.

(3) Estimated debt service based upon 13.0 percent interest, 25-year amortization period, and 10 percent coverage.

(4) Based upon estimated 1985 O & M cost as shown in Table II-12 of PDEIS.

(5) Equal to Total Annual Cost divided by 7,810 EDU's.

- Construction of a subaqueous outfall to Calibogue Sound or the commitment of large tracts of land for spray irrigation are largely irreversible and less flexible than maintaining the existing discharge to Lawton Canal.
- Conveyance of treated wastewater outside of the PSD's for land application will involve more complex institutional arrangements than other alternatives. Obtaining large tracts of land voluntarily for use as spray irrigation sites would be difficult, especially on-island. It is the opinion of the Office of the Attorney General for the State of South Carolina that the condemnation authority of Beaufort County can be used to assist the Sea Pines PSD - Forest Beach PSD in obtaining land for spray irrigation. A copy of this written opinion is included as Appendix D.
- Costs for the total land application of treated wastewater are substantially higher than for either discharge to Calibogue Sound or Lawton Canal.

No-Federal Action Alternative

If EPA does not participate in the funding of a wastewater management program for the Sea Pines PSD - Forest Beach PSD, then the costs for improvement and/or expansion of the PSD wastewater facilities must be borne entirely at the local level. As a result, the costs to users would significantly increase as shown in Table II-15.

2. BROAD CREEK PSD

The Broad Creek PSD wastewater facilities serve the Palmetto Dunes resort area. Wastewater is pumped to and treated at a 600,000 gpd secondary treatment plant which consists of two parallel 300,000 gpd extended aeration activated sludge units. Treated effluent from the plant is disinfected and disposed of by spray irrigation. The peak monthly average flow to the plant during 1980 was 391,000 gpd.

Treated wastewater from the Broad Creek PSD plant is sprayed onto two areas: either onto eighteen holes of the Fazio golf course located within the Palmetto Dunes resort, or onto a 20-acre site located across Route 278 from the treatment plant. Manually-operated valves regulate the conveyance of wastewater to these sites. To date, the two spray areas have been sufficient to dispose of the treated wastewater from the Broad Creek PSD plant.

TABLE II-15

ESTIMATED USER COST SUMMARY FOR
SEA PINES PSD - FOREST BEACH PSD
WASTEWATER MANAGEMENT ALTERNATIVES

<u>Alternative</u>	<u>Estimated Annual User Cost Increase</u>	
	<u>EPA Funding</u>	<u>No EPA Funding</u>
Lawton Canal	\$ 17.70	\$ 37.64
Calibogue Sound	\$ 16.75	\$ 40.69
Rapid Infiltration	\$ 48.23	\$158.64
Spray Irrigation On-Island	\$117.26	\$296.50
Spray Irrigation Off-Island	\$108.59	\$277.26

Projected Wastewater Flows

Wastewater flows for the year 2000 are based upon the "peak month" population and per capita flow rates for each of the population components. Peak monthly average flows for the year 2000 for the Broad Creek PSD are 0.64 mgd (based on OBERS) and 0.81 mgd (based on JPC). By comparison, the Broad Creek PSD has indicated that the year 2000 flow will be in the range of 1.8 mgd to 2.0 mgd. Some of the difference can be attributed to consideration of occupancy rates. When the JPC-based year 2000, peak month population is adjusted to reflect 100 percent occupancy, a corresponding wastewater flow of 1.25 mgd is arrived at.

Wastewater Management Program

Present plans of the Broad Creek PSD envision expansion of the existing 0.6 mgd treatment plant to 1.2 mgd in 1981-1982. The proposed expansion includes the modification of the two existing 300,000 gpd extended aeration activated sludge units to the contact stabilization process. A second expansion from 1.2 to 1.8 mgd is envisioned by July 1984 and a third from 1.8 to 2.4 mgd by July 1988.

As previously indicated, treated wastewater is presently sprayed onto the Fazio golf course and the existing 20-acre spray site. As needs dictate, the Trent Jones golf course will also be irrigated with treated wastewater. These two courses and the existing 20-acre spray site are adequate to handle the OBERS and JPC-based flows projected for the year 2000.

However, additional spray areas will be required to match the design capacity of the proposed 1.2 mgd plant. A third golf course is planned for the Palmetto Dunes Resort which can be utilized for spray irrigation. The wastewater application rates at the Fazio course should be closely monitored in order to better assess seasonal variations in irrigation demands. This will enable more accurate decisions to be made regarding the need and timing for using wastewater to irrigate the other golf courses. This approach will indicate whether the three golf courses and the 20-acre spray site will be adequate to handle the wastewater flows which the Broad Creek PSD plans to provide for, or whether additional areas must be reserved for spray irrigation. Rather than totally rely upon spray irrigation as a disposal method, the PSD may opt to pursue the possibility of a discharge to Port Royal Sound. No significant water quality impacts would be expected from such a discharge based upon the assimilative capacity of the Sound (see Table II-2, Page II-8). However, detailed studies would be required to determine the optimal location and orientation of the diffuser.

EPA Participation

The costs of the Broad Creek expansion program must be borne entirely at the PSD level. Current EPA policy prevents their participation in funding of wastewater facilities greater than the OBERS population. Consequently, the program described above for the Broad Creek PSD represents the no-action alternative with respect to Federal funding.

3. HILTON HEAD NO. 1 PSD

The Hilton Head No. 1 PSD wastewater facilities primarily serve apartments, condominiums, and commercial establishments located within the boundaries of the PSD. Single-family residences within the Port Royal Plantation (except two) are served by septic tanks. Current flows average about 175,000 gpd. Treatment facilities were constructed in 1971 and consist of an unlined oxidation pond followed by two unlined holding ponds. Wastewater from the oxidation pond percolates radially into the groundwater, and analysis of samples taken from observation wells suggests that groundwater contamination is occurring. As a result, DHEC has placed a moratorium on additional connections to the system.

Wastewater from the Port Royal Inn, which is located within the Port Royal Plantation, is pumped to a 15,000 gpd package activated sludge treatment plant. Effluent from the plant is discharged into the plantation's lagoon system. A recent water quality study by DHEC indicates that the discharge has caused nutrient enrichment of these receiving waters.

In order to provide additional capacity, private development has constructed an interim 440,000 gpd treatment facility adjacent to the PSD's existing oxidation pond. This plant will allow the construction of new residential units within the PSD. The interim facility consists of a multi-celled aerated lagoon and holding pond. Treated effluent is pumped from the plant, under Route 278, to Port Royal Plantation for irrigation of the Barony and Robbers Row golf courses. DHEC has approved the use of these courses for the spray irrigation of at least 800,000 gpd of wastewater.

Construction is now underway on a new 800,000 gpd plant to serve existing and future needs within the service area. Completion is scheduled for February 1982. A completely new facility is being built because of the inadequacy of the existing unlined oxidation pond. Components include a complete mix activated sludge package plant with sand drying beds for sludge dewatering. As part of the Hilton Head No. 1 project, the Port Royal Inn package plant will be abandoned and a pumping station and force main constructed to convey wastewater to the new PSD facilities. The entire project is being funded, in part, by the EPA Construction Grants Program.

The unlined oxidation pond and the two holding ponds now existing at the Hilton Head No. 1 PSD facility will be renovated and lined with an impermeable material. These ponds will then be available to store treated effluent from the new package plant prior to spray irrigation.

Projected Wastewater Flows

Peak monthly average flows for the year 2000 for Hilton Head No. 1 PSD are 0.62 mgd (based on OBERS) and 0.76 mgd (based on JPC). Hilton Head No. 1 PSD has recently indicated that the wastewater flows already permitted or committed to proposed development exceed the projected year 2000 wastewater

flow based upon the JPC population. Part of this difference is attributable to the EIS's consideration of less than 100 percent occupancy rates.

Wastewater Management Program

The Hilton Head No. 1 PSD has recently asked DHEC to allow the 440,000 gpd "interim" facility to remain in operation after construction of the new 800,000 gpd plant has been completed. However, the existing Barony and Robbers Row golf courses cannot accommodate the total capacity of 1.24 mgd which would result, although a third golf course in the Port Royal Plantation is planned for construction by the Hilton Head Company within the next four years.

The PSD could elect to obtain additional land for use as a spray area to supplement golf course irrigation. Of existing undeveloped areas, the Hilton Head Airport appears to be most worthy of consideration. Preliminary indications from the Beaufort County Aviation Board are that they would be amenable to the spray irrigation of airport property provided Hilton Head No. 1 would assume the responsibility for mowing and maintaining the spray areas.

Discharge of excess effluent through a subaqueous outfall and diffuser into Port Royal Sound is another alternative. No significant water quality impacts are anticipated. Detailed studies would be required to determine the optimal location and orientation of the diffuser. Opposition to this alternative is likely to be encountered from the public, fishing industry, and regulatory agencies. Therefore, the most prudent course of action for the Hilton Head No. 1 PSD may be to initiate negotiations for the purchase, or long-term lease, of additional land to use as spray areas. Use of the Hilton Head Airport should be pursued immediately. The total amount of land required will be dependent upon the ultimate capacity which the Hilton Head No. 1 PSD desires to construct and the seasonal limitations of the Robbers Row and Barony golf courses.

Accurate records should be kept on the amount of wastewater used to irrigate the Barony and Robber's Row courses so that periodic comparisons can be made regarding seasonal golf course use versus wastewater flow. These data will be useful in projecting the additional spray areas required to supplement golf course irrigation.

EPA Participation

Additional EPA funding will not be available for any future needs of the Hilton Head No. 1 PSD in excess of the 800,000 gpd facilities now under construction (no action alternative). Therefore, the costs for further expansion of the Hilton Head No. 1 PSD treatment facilities beyond 800,000 gpd and for securing additional spray irrigation areas must be borne by developers.

4. HILTON HEAD PLANTATION

Hilton Head Plantation is served by treatment facilities owned and operated by the Hilton Head Plantation Utilities Corporation. The corporation is not eligible to receive EPA grant funds for improvements and/or additions to wastewater facilities.

The Hilton Head Plantation wastewater facilities serve developed property within the plantation boundaries, as well as the Hilton Head Hospital and the Hilton Head Elementary School. Current wastewater flows to the plant average approximately 130,000 gpd. Wastewater is conveyed to and treated at a 500,000 gpd secondary treatment plant. Treated effluent from the plant is disinfected and disposed of by spray irrigation. The existing spray irrigation area consists of 53 acres and is located at the Seabrook Farm near the plant. Treated effluent is sprayed via a portable spray gun onto open fields. The Seabrook spray area is adequate to handle over 400,000 gpd.

Projected Wastewater Flows

Peak monthly average flow projections for the year 2000 for Hilton Head Plantation are 0.31 mgd (based on OBERS), 0.44 mgd (based on JPC). These compare to a wastewater flow of approximately 0.72 mgd based upon the plantation's projections that 2,885 dwelling units will be constructed by the year 2000 resulting in a resident population of 7,213.

Wastewater Management Program

The Hilton Head Plantation plans to expand the existing 0.5 mgd activated sludge package plant to 1.0 mgd during 1984, based upon anticipated housing starts. The resulting capacity will be sufficient to accommodate the year 2000 population which the plantation projects.

As previously indicated, treated wastewater is currently sprayed onto "approved" open areas of the 53-acre Seabrook Farm complex. Additional areas will be required to match the treatment plant capacity of 1.0 mgd.

There are two golf courses in the plantation (Dolphin Head, Bear Creek). A third course is now under construction (Oyster Reef), and a fourth is planned. A proposal to utilize the Dolphin Head golf course as a spray irrigation area for the disposal of treated wastewater is now under consideration by DHEC.

Based upon present flow projections, it appears that spray irrigation of the Seabrook Farm area must be maintained. Spray irrigation of the

Dolphin Head course will supplement the continued use of the existing Seabrook Farm area to adequately handle the year 2000 wastewater flows. The remaining three courses will be available to accommodate the increased wastewater flows as the plantation progresses toward maximum build-out beyond the year 2000.

Available information on current irrigation practices at the Dolphin Head golf course indicate that the course receives an average of 281,000 gpd (0.85 inches per week) during the year. Peak application rates occur in July and August (538,000 gpd or 1.63 inches per week); minimum application rates occur in January and February (73,000 gpd or 0.22 inches per week). Additional data should be collected once wastewater irrigation of the course begins so that updated comparisons can be made regarding seasonal golf course capacities versus wastewater flow. Analysis of these data will determine the timing required for implementing wastewater irrigation at the remaining courses.

In addition to golf course irrigation, Hilton Head Plantation has indicated an interest in developing a wetlands application system within the Cypress Swamp Conservancy in order to restore the natural water table to preserve the area's habitat. This concept is now under consideration by DHEC.

EPA Participation

As previously indicated, Hilton Head Plantation's wastewater treatment and disposal facilities are not eligible for EPA funding. Therefore, any improvements and/or expansions to the system will be funded entirely at the local level, representing a "no Federal action" alternative.

5. NON-PSD AREAS

Areas of Hilton Head Island which lie outside the boundaries of the Hilton Head Plantation or the existing PSD's are served by septic tank-drainfield systems, with the exception of the Mariner's Cove Club and the Northside Trailer Park. There are no areas where widespread septic tank malfunctions are known to occur. An overview of the wastewater management programs for the non-PSD areas, Mariner's Cove, and Northside Trailer Park is presented below.

Community Wastewater Management Alternatives

Although there are no known areas where widespread septic tank malfunctions are occurring, generalized alternatives have been identified and costs developed on a "per household" basis. The alternatives identified

include a community sand mound system, a package plant/spray irrigation alternative, and conveyance to an existing PSD for treatment and disposal (based upon several distances). The annual cost per household is shown in Figure II-8 for each of these alternatives, expressed as a function of the number of households connected.

These annual costs include both the amortized project costs including land (at 7.125 percent, 25 years, 10 percent coverage) and the estimated annual costs for operation and maintenance of the system. Costs are based upon 100 percent local funding. Costs for collection of wastewater are not included for the package plant or PSD alternative. Costs for the community sand mound alternative include the costs related to construction of the area mound; costs for pumping from each septic tank to the mound are not included.

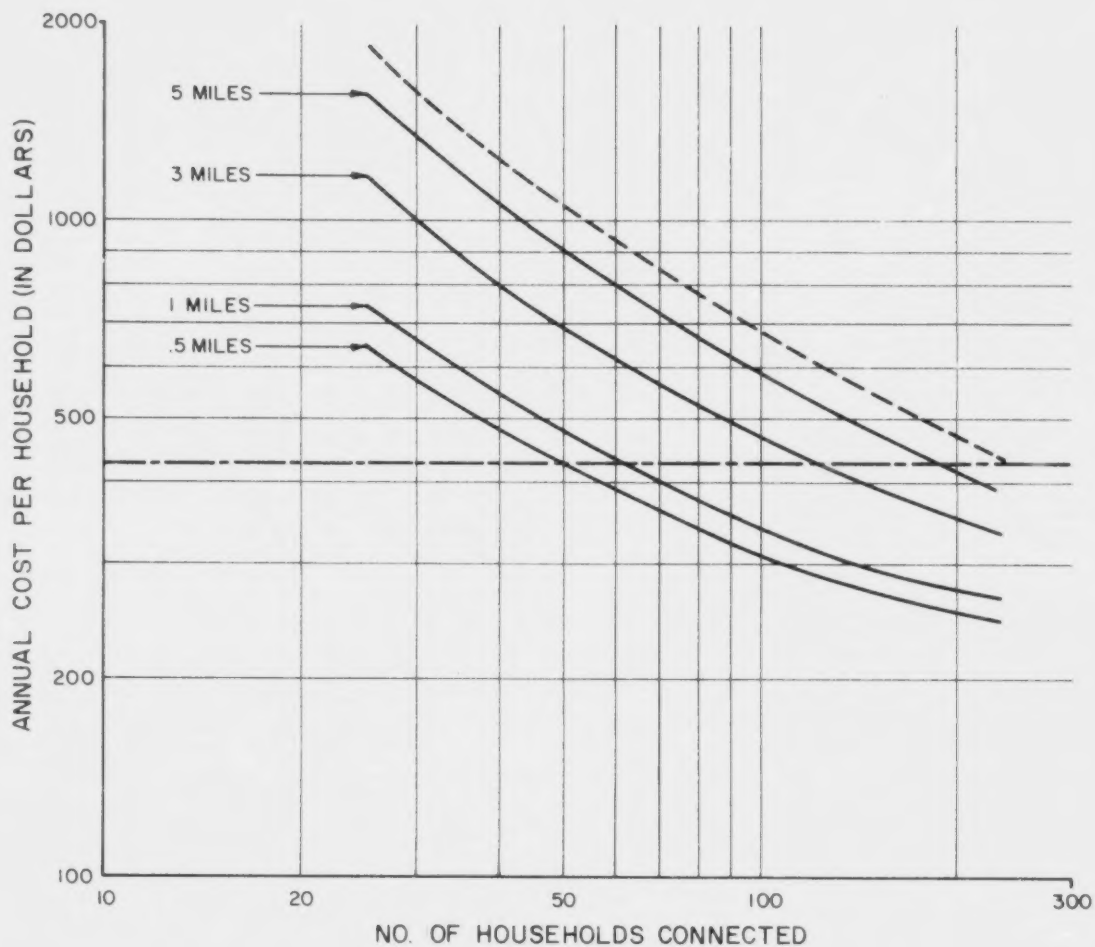
These costs are very general in nature and are intended to show the relationship between the three alternatives as a function of population. More definitive costs can be developed for a specific area experiencing septic tank problems based upon location, area soils and demographic conditions.

The generalized costing effort previously presented serves as a basis from which to select wastewater management systems for a given area. Wastewater management costs for several representative communities in the non-PSD areas have been developed in order to determine approximate costs to users, and therefore the likely feasibility of each. The Chaplin, Muddy Creek, and Baygall areas were selected for investigation because of their size, density, and distance from existing wastewater treatment facilities. Wastewater systems for these areas are presented below.

Chaplin - The Chaplin community lies along Highway 278 between Folly Field Road (south of Port Royal Plantation) and north of Palmetto Dunes resort. A physical house count of the area including Bradley Beach, Burkes Beach, and Singleton Beach Roads tallied 108 residences and trailers; most of the area is of medium density. Because of its relative proximity to the Hilton Head No. 1 PSD, collection and conveyance of wastewater to PSD facilities for treatment and disposal is deemed most cost-effective.

A conventional gravity collection system with pumping station and force main, small-diameter pressure system with grinder pumps, and a vacuum system were considered for the area. Use of a vacuum system was selected because of cost considerations and the ability to serve future infill and perimeter development of the area without major modification.

Costs are developed for the vacuum system including all service connections, piping and fittings, valves, vacuum collection and pump station, and force main to the Hilton Head No. 1 PSD. Total project costs are presented in Table II-16. Estimated annual user charges are developed based upon 100 percent local funding; costs are also developed assuming that 75 percent funding can be obtained, whether from EPA or other sources. As shown, annual user costs range from approximately \$230 to \$536, based upon 25 percent and 100 percent local funding respectively. A pro-rata share of the costs for debt service and operation and maintenance of the new Hilton Head No. 1 PSD plant are not included. These costs could add approximately \$100 to \$125 per year per household.



LEGEND

- COMMUNITY EXTENDED AERATION
PACKAGE PLANT W/SPRAY IRRIGATION
- CONVEYANCE TO NEAREST PSD FOR
TREATMENT AND DISPOSAL
- COMMUNITY SAND MOUND SYSTEM

WASTEWATER TREATMENT AND DISPOSAL COSTS FOR NON-PSD AREAS

II-42a

FIGURE II-8

TABLE II-16

NON-PSD COMMUNITIES
WASTEWATER MANAGEMENT ALTERNATIVES
TOTAL ANNUAL LOCAL COSTS

Alternative Description	Project Cost(1)	Assumed Grant	Local Share	Annual Debt Service(3)	Annual O & M	Total Annual Costs	Number of Initial Users	Initial Annual User Charge Per Household(4)
Chaplin - vacuum sewer system with conveyance of wastewater to Milton Head No. 1 PSD	\$513,500	-0-	\$513,500	\$49,019	\$8,856	\$57,875	108	\$536
	\$513,500	\$346,613(2)	\$166,887	\$15,931	\$8,856	\$24,787	108	\$230
Muddy Creek and Baygall - community sand mound system to serve six homes	\$670,423	-0-	\$670,423	\$63,999	\$6,864	\$70,863	78	\$909
	\$670,423	\$452,536(2)	\$217,887	\$20,799	\$6,864	\$27,663	78	\$355
Individual Home - with malfunctioning septic tank drainfield	\$ 6,883	-0-	\$ 6,883	\$ 657	\$ 45	\$ 702	1	\$702
	\$ 6,883	\$ 4,646(2)	\$ 2,237	\$ 214	\$ 45	\$ 259	1	\$259

(1) Includes 30 percent allowance for engineering, legal, and administrative costs.

(2) Based upon 75 percent funding of eligible costs. Eligible costs assumed to equal 90 percent of project cost.

(3) Estimated debt service based upon 7.125 percent interest, 25-year amortization period, and 10 percent coverage.

(4) Estimated user charges are presented only for the purpose of determining financial feasibility and should not be interpreted as recommended charges.

Project costs are based upon the existing population which will be served. Future development in the area would tend to decrease the costs for all users. Also, the initial project could be trimmed to the more populous areas of the community, with service for the extreme portions of Bradley Beach, Burkes Beach, and Singleton Beach Roads deferred to a second phase. Total project costs and user charges would thus be reduced.

Muddy Creek Area - The Muddy Creek area along Muddy Creek Road, Bryan Road, and Spanish Wells Roads (between Spanish Wells Plantation and Pond Drive) contains approximately 78 residences. The homes are clustered in small groups with substantial distances between the clusters. Because of the small number of homes, their "cluster" grouping, and their substantial distance from any existing wastewater treatment facilities, an alternate approach to conventional gravity collection and pumping was evaluated for the area.

Community sand mound systems are envisioned; each "cluster" of homes would be served by an elevated sand mound which would be located nearby. Wastewater would be pumped from the septic tank at each home to the community mound for application. The mound would serve as a physical and biological medium through which the applied wastewater would filter before reaching natural soil.

Costs for a typical system have been developed based upon six homes per community mound. The size of the mound area required to serve six homes is approximately 16,000 square feet. Project costs cover construction of the sand mound, pumping and related controls at each home, piping from each home to the sand mound, land purchase, and engineering. Total approximate project costs for a six-home system are presented in Table II-16; estimated annual user charges are also developed based upon either 100 percent local funding or 25 percent local funding assuming 75 percent "outside" funding could be obtained. As shown, annual user costs range from approximately \$305 to \$909 for 25 percent and 100 percent local funding respectively.

Baygall Area - The Baygall community is located at the end of Beach City Road and encompasses residences along Fish Haul, Baygall, and Mitchellville Roads. At present, the community population is too small and too far from existing wastewater treatment facilities to consider a conventional wastewater collection and conveyance system.

Because of similarities to the Muddy Creek area, costs have been developed for a community sand mound system for the Baygall area. Again, system costs are based upon a six-home community sand mound, with necessary pumping facilities located at each individual home. Total project costs, local costs, and approximate annual user charges are the same as those developed for the Muddy Creek area. These costs are shown in Table II-16.

Individual Homes - When isolated instances of septic tank malfunctions occur, corrective measures are made on an individual rather than community basis. One possible solution for a malfunctioning drainfield is the construction of an elevated sand mound for disposal of the septic tank effluent. Generalized costs are shown in Table II-16. Estimated annual user costs are also shown in the table; these costs presume that construction and operation and maintenance costs will be financed through some form of public management agency. Costs are based upon either 100 percent or 25 percent local funding.

Northside Trailer Park

The Northside Trailer Park is located on the north end of Hilton Head, off of Gumtree Road. Residents of the trailer park have been asked by the Hilton Head Plantation Company to vacate the property after which the existing 10,000 gpd package plant will be abandoned.

Mariner's Cove

The Mariner's Cove plant provides treatment for the wastewater generated from forty units of the Mariner's Cove Club complex, which is located south of Route 278 near the bridge to Pinckney Island. Effluent from the plant is spray irrigated. The plant is owned by the Mariner's Cove Horizontal Property Regime.

Consideration is being given to the creation of a Public Service District, through appropriate legal mechanisms, to assume the provision of wastewater treatment and disposal for the Mariner's Cove complex. The exact boundaries that the PSD would encompass are uncertain at this time.

CHAPTER III
AFFECTED ENVIRONMENT, ENVIRONMENTAL CONSEQUENCES
OF THE ALTERNATIVES AND MITIGATIVE MEASURES



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CHAPTER III - AFFECTED ENVIRONMENT, ENVIRONMENTAL CONSEQUENCES OF THE ALTERNATIVES AND MITIGATIVE MEASURES

PART A. INTRODUCTION

This chapter summarizes the existing natural and man-made environment of the study area, discusses the environmental impacts of the alternatives and proposes possible measures to mitigate these impacts. The purpose of the environmental setting summary is the establishment of existing baseline conditions in the area. The impacts of the various alternatives are gauged against these existing conditions. The discussion is organized to first present primary impacts expected from the implementation of the alternatives. This section is followed by a discussion of the secondary impacts expected from the various alternatives. A complete discussion of Hilton Head's existing environment is presented in the complete Environmental Inventory which is bound separately as a Reference Document.

PART B. PRIMARY IMPACTS

1. SURFACE WATER RESOURCES

High water quality conditions surround Hilton Head with one significant exception. The coliform levels required to maintain SA quality waters are not being met in Lawton Creek and some areas of Broad Creek. This has caused the closing of these waters to shellfish harvesting.

Routine monitoring of the shellfish beds surrounding Hilton Head has been conducted since the mid-1960's. During the 1977-1978 oyster season the Division of Shellfish and Recreational Waters found unusually high fecal coliform counts during routine investigations of oyster meats from shell stock taken from Lawton Creek. This resulted in an analysis of surface water samples from Lawton Creek in July 1978 which revealed high total and fecal coliform counts. In August 1978 DHEC closed shellfish beds from "all waters and bottoms of Lawton Creek and Canal and Point Comfort Creek and the adjacent shore of Broad Creek running the length of Buck Island and Marsh (refer to Plate I-3)". Prior to this time harvesting of oysters had only been prohibited by DHEC from "the waters and bottoms within a 1000 ft. radius of Palmetto Bay Marina, Harbour Town Marina, and Baynard Cove Marina".

The 1978 closure of Lawton Creek to shellfishing precipitated a number of special water quality studies by DHEC. These studies concentrated on the bacterial and hydrologic characteristics of the Sea Pines PSD treatment plant, Lawton Canal, Lawton Creek, and Broad Creek. The locations of sampling stations are shown on Plate III-1.

Water quality and bacteria samples were collected during dry and wet climatic periods to evaluate the extent of point and non-point source pollution. A program of groundwater sampling was also conducted within Sea Pines in order to obtain additional data regarding possible sources of non-point pollution.

These studies indicated that state standards and Federal criteria for shellfish waters are violated in the Lawton Creek, Baynard Creek, and Point Comfort Creek Drainage Systems. While concentrations of bacteria in the Sea Pines wastewater treatment plant effluent remained consistently low, bacterial levels in the surface waters increased with rainfall events and tended to increase from high to low tide. These fluctuations point to non-point pollution originating in the interior of Hilton Head Island and draining into the shellfish waters of Broad Creek. Specific sources of non-point pollution could not be identified.

The quality of surface waters surrounding Hilton Head would be impacted by two of the alternatives: the Calibogue Sound discharge, and the continuation of the Lawton Canal discharge. A stimulation of greater primary productivity due to increased nutrient loadings and dissolved oxygen fluctuations could be expected from either. These impacts would be greater for a discharge into Lawton Canal than for a discharge into Calibogue Sound which has a larger assimilative capacity as indicated previously in Table II-2. Circulation studies would be required for the Calibogue Sound alternative to select the specific location and orientation of the outfall diffuser which would minimize impacts on water quality. Under both discharge alternatives, chlorine disinfection would introduce chlorinated compounds into the water column.

A continued discharge to Lawton Canal would result in an increase in the size of the buffer zone closed to shellfish harvesting as wastewater flows continued to increase. The size of the buffer zone is related to the time required to shutdown shellfish harvesting activities in the event of total plant failure.

An alternative making Federal funding contingent upon the correction of the non-point source problem is the only alternative which encourages improvement in the non-point source situation. Under this alternative, no Federal funds would be provided for wastewater disposal unless non-point source control measures are implemented.

Minimal impacts could occur from runoff at the woodlands irrigation sites for the land application alternatives. The Forest Beach parcels (rapid infiltration alternative) are located contiguous to the Shipyard Plantation lagoon system. Within the Gardner-Matthews tract there are freshwater wetland areas which must be considered during layout of the irrigation system.

LEGEND

- ▲ DHEC SPECIAL STUDY, SEPTEMBER 1978
- DHEC NON-POINT SOURCE SAMPLING, AUGUST 1979 TO OCTOBER 1979
- DHEC HILTON HEAD NON-POINT SOURCE, HISTORICAL PERSPECTIVE REPORT, DECEMBER 1978 TO MARCH 1979





PINCKNEY ISLAND

JAMES F BYRNES
BRIDGE

SKULL CREEK

U.S.

ROUTE 278

SQUIRE POPE ROAD

HORSE ROAD

GUMTREE ROAD

WILD

JARVIS CREEK

OLD

HOUSE CREEK

ROAD

SPANISH

WELLS

MARSHLAND

ROAD

BROAD CREEK

SOUND

34L

35L

BAY ROAD

1979
IVE



PINCKNEY ISLAND

SQUIRE POPE ROAD

HORSE ROAD

WILD

GUMTREE ROAD

PORT

ROYAL

SOUND

BEACH CITY ROAD

U.S. ROUTE 278

DRIVE

HILTON HEAD AIRPORT

MATTHEWS

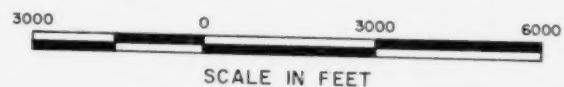
ROAD







PLATE III - I
HILTON HEAD ISLAND
SOUTH CAROLINA
LOCATION OF
SAMPLING STATIONS



U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION IV ATLANTA, GEORGIA

For the wetlands discharge system under all five alternatives, there is a possibility that wastewater could eventually reach Lawton Canal, dependent upon points of release, rates of application, and hydrologic conditions. Impacts should be minimal because of the additional treatment which would be afforded to the applied wastewater during its passage. The wetlands discharge system could have a major beneficial impact on water levels within the Forest Preserve. Periods of drought and diversion of natural recharge have dried up many wetlands areas within the Preserve thereby altering the natural habitat.

The quantity of water in Lawton Canal will increase from a direct discharge (Lawton Canal alternative) or from lateral recharge from the rapid infiltration system (rapid infiltration alternative). Increased flow in lagoons and other inland water bodies could result from runoff and/or lateral recharge from the three land application alternatives.

2. GROUNDWATER RESOURCES

There is inconclusive evidence that Hilton Head Island is a recharge area for the principal artesian aquifer which serves as the primary source of water for users on the island. The first evidence that Hilton Head Island is a recharge area surfaced in 1970 in a paper by Back, Hanshaw, and Rubin. They showed that groundwater levels had stabilized at the zero potentiometric contour positioned around the center of the island, while to the north and south, the groundwater level declined.

More recently, both the South Carolina Water Resources Commission and the South Carolina Department of Health and Environmental Control have conducted well tests that show that there is 100 percent sand from the top of the soil down to the aquifer. No confining clay layer covers the aquifer. The top of the principal artesian aquifer ranges from about 80 feet below msl in the extreme north end of the island to about 120 feet below msl in the southern end of the island.

Potential impacts to groundwater resources are greatest from the rapid infiltration alternative because the rapid infiltration system will remove nitrogen from the applied wastewater to a much lesser extent than any other land application techniques. Additional nitrogen removal at the Sea Pines PSD plant would be required should groundwater monitoring indicate that nitrate contamination of the aquifer was occurring.

Substantially lesser impacts to the groundwater are expected from the proposed woodlands irrigation systems because they will result in more complete renovation of the applied wastewater. Wando soils pervade the Gardner-Matthews site. Depth to groundwater appears adequate, although detailed soils investigations have not yet been conducted.

Rapid infiltration, woodland irrigation, and/or wetlands discharge will result in the recharge of the Hawthorn Formation. Spray irrigation to the golf courses, which is a part of all the alternatives, will decrease

the demand for groundwater for irrigation. This will also result in recharge of the groundwater aquifer system as well as reduced demand for pumping. The surface water discharge alternatives will have no adverse impact on groundwater quality. However, these alternatives will not provide for the reuse of treated wastewater as a beneficial resource.

3. ECOLOGICAL RESOURCES

Land application systems would result in a greater adverse impact to terrestrial ecosystems on Hilton Head than would alternatives relying on discharge to surface waters.

The Gardner-Matthews site can be characterized as an upland forest which is predominately mixed hardwood with some pine. The total site is composed of between 5 and 10 percent wetlands. The Union Camp site on the mainland is predominately pine forest. The Shipyard Plantation spray irrigation sites (component of the rapid infiltration alternative) are also wooded.

Clearing would be required for installation of woodlands irrigation systems under the land application alternatives, thus resulting in some habitat alteration. Impacts would be minimized through the use of solid-set spray systems rather than center pivot systems. In addition, woodlands irrigation would cause shifts in vegetation and wildlife composition toward species which are more water-tolerant. Such impacts are difficult to classify as beneficial or adverse unless net reductions in diversity, productivity, abundance, or protected species occur.

Disruption of beach communities would occur during installation of the Calibogue Sound outfall across South Beach. This crossing will also impact nesting areas for least terns and the threatened loggerhead turtle depending on the timing of construction activities.

Construction of the rapid infiltration system would result in the permanent loss of over twelve acres of wildlife habitat within the Forest Preserve; construction of the 8-acre holding pond at the Gardner-Matthews site or at the off-island site would also result in a permanent loss of wildlife habitat.

The wetlands discharge system, which is incorporated into each alternative, will restore the natural habitat within the Forest Preserve and should be conducive to the maintenance of wetland communities. Improved habitat conditions could result for protected species such as the American alligator. However, adverse impacts may be incurred because of effects on two wading bird colonies known to exist in the Preserve. Studies of bird populations at cypress dome wetlands in Florida have shown dramatic decreases in habitat usage by wading birds (Jetters 1975; Jetters and Harris 1976) coincident with the introduction of treated wastewater.

For the wetlands discharge system under all five alternatives, there is a possibility that wastewater could eventually reach Lawton Canal, dependent upon points of release, rates of application, and hydrologic conditions. Impacts should be minimal because of the additional treatment which would be afforded to the applied wastewater during its passage. The wetlands discharge system could have a major beneficial impact on water levels within the Forest Preserve. Periods of drought and diversion of natural recharge have dried up many wetlands areas within the Preserve thereby altering the natural habitat.

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More recently, both the South Carolina Water Resources Commission and the South Carolina Department of Health and Environmental Control have conducted well tests that show that there is 100 percent sand from the top of the soil down to the aquifer. No confining clay layer covers the aquifer. The top of the principal artesian aquifer ranges from about 80 feet below msl in the extreme north end of the island to about 120 feet below msl in the southern end of the island.

Potential impacts to groundwater resources are greatest from the rapid infiltration alternative because the rapid infiltration system will remove nitrogen from the applied wastewater to a much lesser extent than any other land application techniques. Additional nitrogen removal at the Sea Pines PSD plant would be required should groundwater monitoring indicate that nitrate contamination of the aquifer was occurring.

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Land application systems would result in a greater adverse impact to terrestrial ecosystems on Hilton Head than would alternatives relying on discharge to surface waters.

The Gardner-Matthews site can be characterized as an upland forest which is predominately mixed hardwood with some pine. The total site is composed of between 5 and 10 percent wetlands. The Union Camp site on the mainland is predominately pine forest. The Shipyard Plantation spray irrigation sites (component of the rapid infiltration alternative) are also wooded.

Clearing would be required for installation of woodlands irrigation systems under the land application alternatives, thus resulting in some habitat alteration. Impacts would be minimized through the use of solid-set spray systems rather than center pivot systems. In addition, woodlands irrigation would cause shifts in vegetation and wildlife composition toward species which are more water-tolerant. Such impacts are difficult to classify as beneficial or adverse unless net reductions in diversity, productivity, abundance, or protected species occur.

Disruption of beach communities would occur during installation of the Calibogue Sound outfall across South Beach. This crossing will also impact nesting areas for least terns and the threatened loggerhead turtle depending on the timing of construction activities.

Construction of the rapid infiltration system would result in the permanent loss of over twelve acres of wildlife habitat within the Forest Preserve; construction of the 8-acre holding pond at the Gardner-Matthews site or at the off-island site would also result in a permanent loss of wildlife habitat.

The wetlands discharge system, which is incorporated into each alternative, will restore the natural habitat within the Forest Preserve and should be conducive to the maintenance of wetland communities. Improved habitat conditions could result for protected species such as the American alligator. However, adverse impacts may be incurred because of effects on two wading bird colonies known to exist in the Preserve. Studies of bird populations at cypress dome wetlands in Florida have shown dramatic decreases in habitat usage by wading birds (Jetters 1975; Jetters and Harris 1976) coincident with the introduction of treated wastewater.

4. AQUATIC SYSTEMS

Estuarine waters comprise the primary aquatic system of the Hilton Head study area. Included within the estuarine system are tidal creeks, coastal bays and sounds, river mouths, and tidal marshes and flats. A freshwater system may also be recognized, but it is limited in extent and largely inter-grades with the freshwater wetland plant communities on Hilton Head Island.

Adverse impacts to aquatic ecosystems will result from alternatives involving a discharge to surface waters. In particular, the South Carolina Wildlife and Marine Resources Department has expressed concern regarding any discharge to the marine environment.

Discharge to Calibogue Sound would result in a localized decrease in the diversity of benthic communities along the subaqueous outfall and diffuser. Increased biological productivity would result from nutrient loadings and likely be channeled into one of several opportunistic animal species. However, with proper location and design of the diffuser structure, these impacts should be minimal.

Discharge to Lawton Canal would also result in impacts to the aquatic ecosystems. These impacts would be expected to be lesser than those from unabated non-point source runoff. Stream bed erosion along Lawton Canal from the increased volume of discharge could increase turbidity and disrupt benthic communities.

The continued use of chlorine as a disinfectant poses concerns regarding potential impacts to the aquatic ecosystems for discharge into either Lawton Canal or Calibogue Sound. Dechlorination or alternate methods of disinfection could minimize this adverse impact.

There are also several areas of concern with respect to the wetlands discharge system which is part of each alternative. The introduction of treated wastewater into the Forest Preserve could produce anaerobic conditions resulting in significant changes to the faunal community. In addition, the elevation of nutrient levels could result in significant changes in the plant community with potential for algal or duckweed blooms. The controlled experimental program which is being implemented by the Sea Pines PSD will provide valuable information with respect to these potential impacts. Field investigations should be performed in order to establish baseline conditions against which possible changes can be monitored.

Wetlands comprise approximately 45 acres (less than 5 percent) of the Gardner-Matthews site. Two wading bird colonies exist near its periphery. Major adverse impacts could result if these environmentally-sensitive areas are significantly altered or disturbed. Such impacts should be able to be avoided because of the large amount of uplands at the site and the peripheral location of the bird colonies and most of the wetlands.

5. POPULATION AND LAND USE

Selection of the land application alternatives would eliminate these currently undeveloped tracts of land as potential areas of settlement for population growth in the future. The projected needs for Sea Pines - Forest Beach would be approximately 500 acres for spray irrigation on the Gardner-Matthews or the off-island tracts. Current development plans for the Gardner-Matthews site will call for about 3800 units on 1800 acres of land which averages out to slightly more than two units per acre. The owners of the land could increase densities on the remainder of the tract to make up for the land which would be used for spray irrigation. Therefore the total number of people living on the site would not change.

The spray irrigation component of the rapid infiltration alternative would take 67 acres out of potential use for future development in Shipyard Plantation. It is expected that the area would be developed as residential property. Current master plans call for multi-family villas on the Shipyard site.

The wetlands application proposed for the Sea Pines Forest Preserve will not alter the land use specified for this area in the property covenants. According to the Sea Pines Master Plan, this area has been planned to remain in its natural state.

6. ECONOMICS

The Lawton Canal alternative will increase the area closed to shellfish harvesting in Broad Creek due to the necessity for the enlarged buffer zone. This will decrease the potential harvest in the lease area as shown previously in Plate ES-1. This action would be a continuation of the long-standing trend of closures of shellfish harvesting areas in Broad Creek for marinas and because of non-point source problems.

The Calibogue Sound alternative would not cause the closing of any shellfish harvesting areas. Although the discharge area is officially classified as SA waters, there are no active leases in the area which would be included in the buffer zone. Many local residents have expressed the concern that the implementation of this alternative would be harmful to the fishing industry in general. EPA can not substantiate these concerns. A further discussion is presented in the water quality section of this chapter.

The cultural aspect of the local fishery has been considered in the EIS. Most of the people employed by the seafood industry around Hilton Head are low income blacks. Loss or degeneration of the fisheries could have a major impact on them as well as a number of white families, both of whose fishing heritages have been passed down from generation to generation. The loss would cause not only an economic impact but the displacement of a people whose way of life can not be valued in monetary terms.

The value of the fishery to the island developers and to the tourist trade has also been considered. People have been attracted to Hilton Head because of its mild climate, pristine waters, excellent sportfishing and fine local seafood restaurants. Consequently, degeneration of the fishery by pollution of local waters could adversely impact much of Hilton Head's appeal and could possibly reduce property values.

South Carolina DHEC indicates that no buffer zones would be required as a result of the implementation of any of the land application alternatives.

The implementation of any of the alternatives will result in the creation of construction related jobs. There is no significant difference among the alternatives in the degree of this impact.

The implementation of the land application alternatives would eliminate these sites from future development. This would involve approximately 500 acres at the Gardner-Matthews or the off-island site and 67 acres at the Shipyard Plantation site under the rapid infiltration alternative.

7. ARCHEOLOGICAL AND HISTORICAL

Archeological surveys would be required to document potential impacts of all alternatives except Lawton Canal. The greatest potential impacts are related to the land application alternatives.

8. NOISE

Construction related impacts would come from plant upgrading, installation of force mains including highway tunneling, and site preparation at land application sites. These impacts would be the smallest for the Lawton Canal alternative since the smallest amount of construction would be involved and this construction would be limited to the area of the existing site. None of the noise impacts associated with any of the alternatives is expected to be significant.

PART C. SECONDARY IMPACTS

Population growth has proceeded rapidly on Hilton Head Island for the last several years and all indications are that this trend will continue in the future. JPC and OBERS population projections are presented in Tables III-1 and III-2 respectively. The JPC population projections presented in Table III-1 represent an increase of approximately 230 percent over present levels by the year 2000. An increase of this magnitude will cause severe strain on all aspects of the natural and manmade environments.

TABLE III-1

DISAGGREGATION OF YEAR 2000
POPULATION FOR HILTON HEAD ISLAND
JPC BASE

Service Area	Permanent Residents	Overnight Visitors	Off-Island Employees	Seasonal Residents	Day Visitors	Total
Sea Pines PSD	11,327	6,245	2,074	975	375	20,996
Forest Beach PSD	3,951	6,428	2,068	2,200	475	15,122
Broad Creek PSD	1,976	3,752	1,573	1,440	240	8,981
Hilton Head No. 1 PSD	2,581	3,163	1,585	875	475	8,679
Hilton Head Plantation	2,713	466	1,359	480	90	5,108
Long Cove Club	1,238	0	187	50	60	1,535
Non-PSD	2,555	223	968	90	210	4,046
Total	26,341	20,277	9,814	6,110	1,925	64,467

TABLE III-2

DISAGGREGATION OF YEAR 2000
POPULATION FOR HILTON HEAD ISLAND
OBERS BASE

Service Area	Permanent Residents	Overnight Visitors	Off-Island Employees	Total
Sea Pines PSD	9,443	7,364	842	17,649
Forest Beach PSD	3,294	7,579	838	11,711
Broad Creek PSD	1,647	4,423	632	6,702
Hilton Head No. 1 PSD	2,152	3,730	642	6,524
Hilton Head Plantation	2,262	550	550	3,362
Long Cove Club	1,032	0	62	1,094
Non-PSD	2,130	263	387	2,780
Total	21,961	23,909	3,953	49,823

Although all the alternatives discussed in the EIS will provide service for the JPC capacity, the disposal option that is implemented will have a significant impact on the ultimate population of the Island. This ultimate population will directly affect the demand for the area's community services and facilities as well as impact the natural environment.

Ultimate capacities for residential units within the Sea Pines PSD area are limited by restrictive covenants in the deeds of the homeowners. However, hotel type developments, both in the Sea Pines PSD and the Forest Beach PSD, are not limited. No legal constraints exist elsewhere on the Island which could effectively be used to limit population density.

Increased population levels would be harder to support under the land application alternatives due to the need to buy more land in the future. This would be especially applicable for the on-island land application alternative due to the constantly increasing land costs and decreasing availability of land. These alternatives would create a perception of a wastewater disposal system which was limited in nature. Developers would be inclined to keep densities low to insure that disposal capacity was available either with a PSD or on their own land.

The wastewater disposal alternatives involving surface discharges would be more flexible regarding increasing capacities in the future. Only increased plant capacity, pumping capability through the outfalls, and increased NPDES permit limitations would be required. Developers would no longer consider wastewater disposal as a serious constraint to development and would tend to plan developments with higher densities.

The alternative which limits the provision of Federal funds based on control of non-point source pollution and the no-Federal action alternative will not affect ultimate population density based on the potential lack of Federal funds. Market conditions are such that developers will assist the PSD's in financing the cost of these alternatives if necessary. This type of arrangement has already occurred in some instances on Hilton Head.

The remainder of this section discusses the secondary impacts of the population levels which will result from the various alternatives upon each aspect of the manmade and natural environments.

1. LAND USE

With the construction of the Byrnes Bridge in 1956, development began according to the resort plantation concept. Plantations are best described as large-scale planned unit developments which combine residential and open space/recreation land uses and occasionally include shopping facilities and restaurants. Approximately 30 percent of the Island's 42 square miles have been developed as shown in Plate III-2. The south end of the Island is more intensely developed than the north end. Table III-3 shows the land uses occupying the island's 27,954 acres and the percent utilization of each land use category.

LEGEND

	RESIDENTIAL
	OPEN SPACE / RECREATIONAL
	COMMERCIAL / INSTITUTIONAL
	FOREST / AGRICULTURAL
	UNDEVELOPED LAND, PRIVATE BEACHES AND MARSHES





PINCKNEY ISLAND

JAMES F. BYRNES
BRIDGE

SKULL CREEK

U.S. ROUTE 278

SQUI

POP

ROAD

ROAD

ROAD

ROAD

ROAD

ROAD

ROAD

ROAD

ROAD

ROAD

ROAD

ROAD

ROAD

ROAD

ROAD

ROAD

WILD

OLD

JARVIS CREEK

CREEK

HOUSE

WISH

WELLS

ROAD

SOUND

CALIBOGUE

MARSHLAND

BROAD CREEK

ROAD

ROAD

PORT

PINCKNEY ISLAND

ROAD

POP

ROAD

ROAD

WILD

GUMTREE

BEACH

CITY

ROAD

U.S. ROUTE 278

DRIVE

HILTON HEAD AIRPORT

MATTHEWS

PORT

ROYAL

SOUND





CALIBOGUE

SOUND

JARVIS

CREEK

OLD

CREEK

NISH

WELLS

ROAD

MARSHLAND

CREEK

ROAD

CREEK

PALMETTO BAY ROAD

SEA PINES CIRCLE

POPE AVENUE

COLIGNY CIRCLE

U.S. ROUTE 278

ANTIC

OCEAN

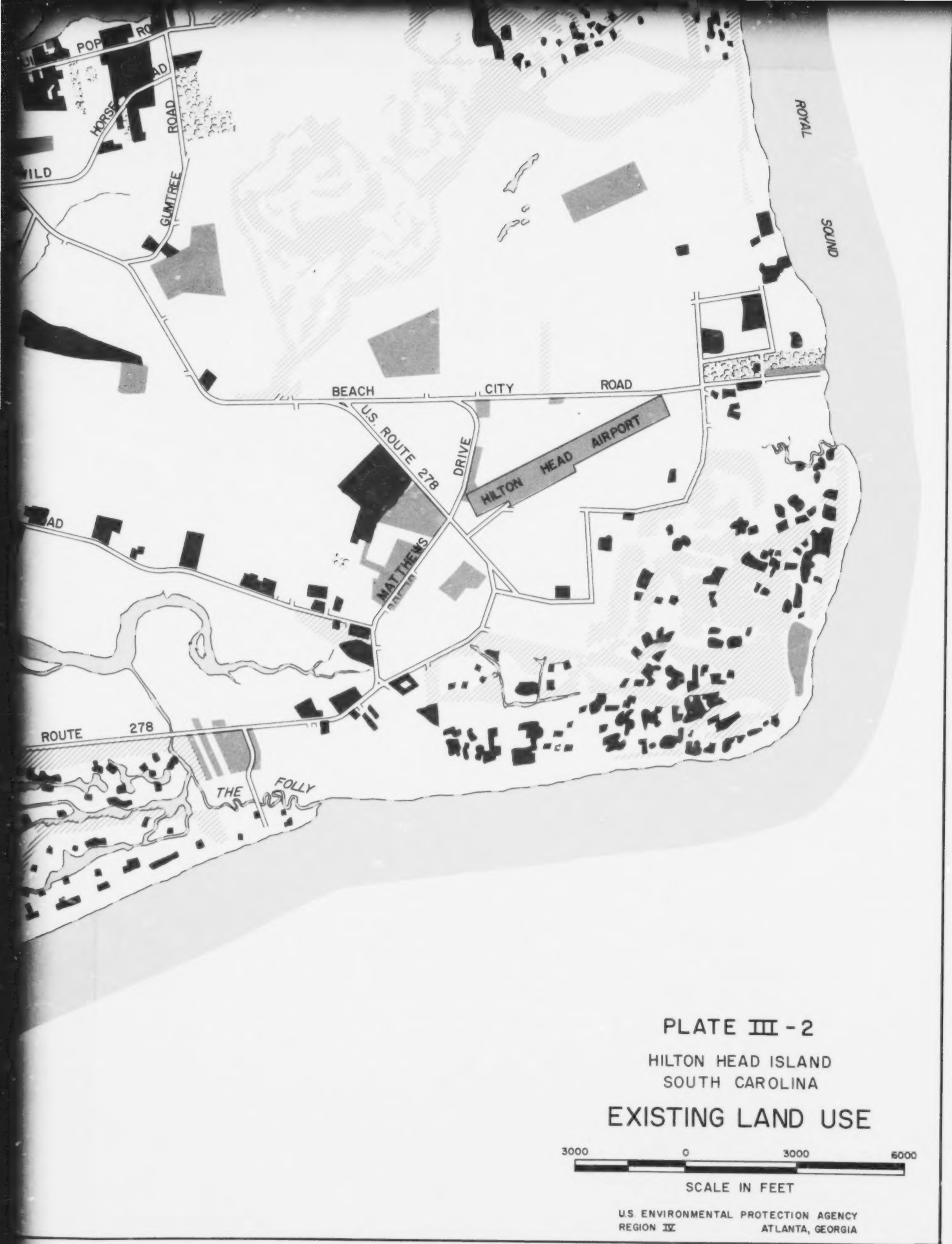


TABLE III-3
HILTON HEAD ISLAND
SUMMARY OF EXISTING LAND USE BY ACRES AND PERCENT USE

Land Use	Acres	Percent
Residential	4,365	15.6
Single Family	3,253	11.6
Multi-Family	796	2.8
Mobile Home	316	1.2
Commercial	319	1.1
Industrial/Utility	31	0.1
Open Space/Recreation	3,716	13.3
Institutional/Public Facility	160	0.6
Cemetery	25	0.1
Transportation		
Streets, alleys, roads, utility rights of way	1,090	5.9
Forest/Agriculture	214	0.8
Total Developed Area	9,920	35.5
Undeveloped Area	18,034	64.5
Vacant	13,052	46.7
Marsh	4,308	15.4
Water	674	2.4
TOTAL:	27,954	100.0

Source: Beaufort County Joint Planning Commission, 1981.

As shown in Table III-3, 13,052 acres (46.7 percent) are classified as vacant land and can be considered to have development potential, subject to detailed engineering surveys. The rate and location of future development on the island will come about in response to private market conditions and the availability of public and private utilities.

Approximately 17,500 acres of the island's 28,000 acres (63.0 percent) are currently owned by the plantation developers, all of whom have filed masterplans with the JPC. Estimates of the number of dwelling units to be eventually constructed can be derived from these masterplans with reasonable accuracy. Table III-4 displays these data. With the possible exception of Sea Pines Plantation, none of the plantations is expected to be fully built out by the year 2000. Plate III-3 shows plantation locations.

The remaining 10,500 acres are owned by individuals or non-plantation developers, and approximately 25 to 30 percent of this land is currently developed. Because these areas are not masterplanned, it is extremely difficult to predict their rate of development and ultimate land uses. A portion of this land will be converted to villa and multi-family uses. Commercial development will increase along Highway 278 in response to population growth as shown in Table III-5. Much of the new commercial development will take place at the northern end of the island to serve a growing resort and residential base in that area. Future land use is shown in Plate III-4.

Much of the undeveloped non-plantation land located in the northern half of the island is known as Heir's Property (see Plate III-3). These tracts date back to the allocation of 40-acre parcels to black families during Reconstruction. During the past hundred years, these tracts have passed with divided and undivided interest to the heirs of the original property owners. In many instances, titles are now unclear, and the task of assembling parcels into large enough tracts to warrant significant development is too cumbersome. Thus the development potential of Heir's Property is severely constrained at this time. The black community's difficulties encountered in participating in the capital appreciation of the island's land has had social and political repercussions.

In addition to title problems, most of the Heir's Property is not served by a Public Service District and consequently is unsewered. Thus, Heir's Property land will continue to remain in low density residential uses until such time as sewer service is available and the land becomes attractive to developers. The capital costs of providing wastewater management services to these areas and the ability of the population served to meet connection fees and user charges is a significant concern of black community leaders.

Both existing and future land uses are discussed in greater detail in the Environmental Inventory Task Report which is provided as a Technical Reference Document. Table III-6 summarizes the most recent findings of the JPC Land Use Plan study. Multi-family units are expected to increase from approximately half of the existing housing stock to two-thirds of the future housing inventory, leading to greater densities per developed acre.

TABLE III-4
HILTON HEAD ISLAND
PLANTATION DWELLING UNITS AT BUILD OUT

<u>Plantation</u>	<u>Single-Family</u>	<u>Multi-Family</u>	<u>Hotel</u>
Windmill Harbor	56	414	
Hilton Head	2530	3420	
Palmetto Dunes Highlands(1)	1231	1368	
Gardner-Matthews	722	3472	
Port Royal	849	122	450
Spanish Wells	189		
Shelter Cove		1401	
Palmetto Dunes	1101	3500	760
Long Cove Club	650	200	
Long Cove Plantation	382	143	
Shipyard	351	1119	341
Sea Pines	3790	2100	494
	11,851	17,259	2,045

(1) Estimated

Source: Beaufort Joint Planning Commission, Sea Pines Company, EMRO Land Company, Hilton Head Plantation, Palmetto Dunes Resort





PINCKNEY ISLAND

HILTON HEAD PLANTATION

PORT

ROYAL

SOUND

WILDS PLANTATION

BEACH

CITY

ROAD

U.S. ROUTE 278

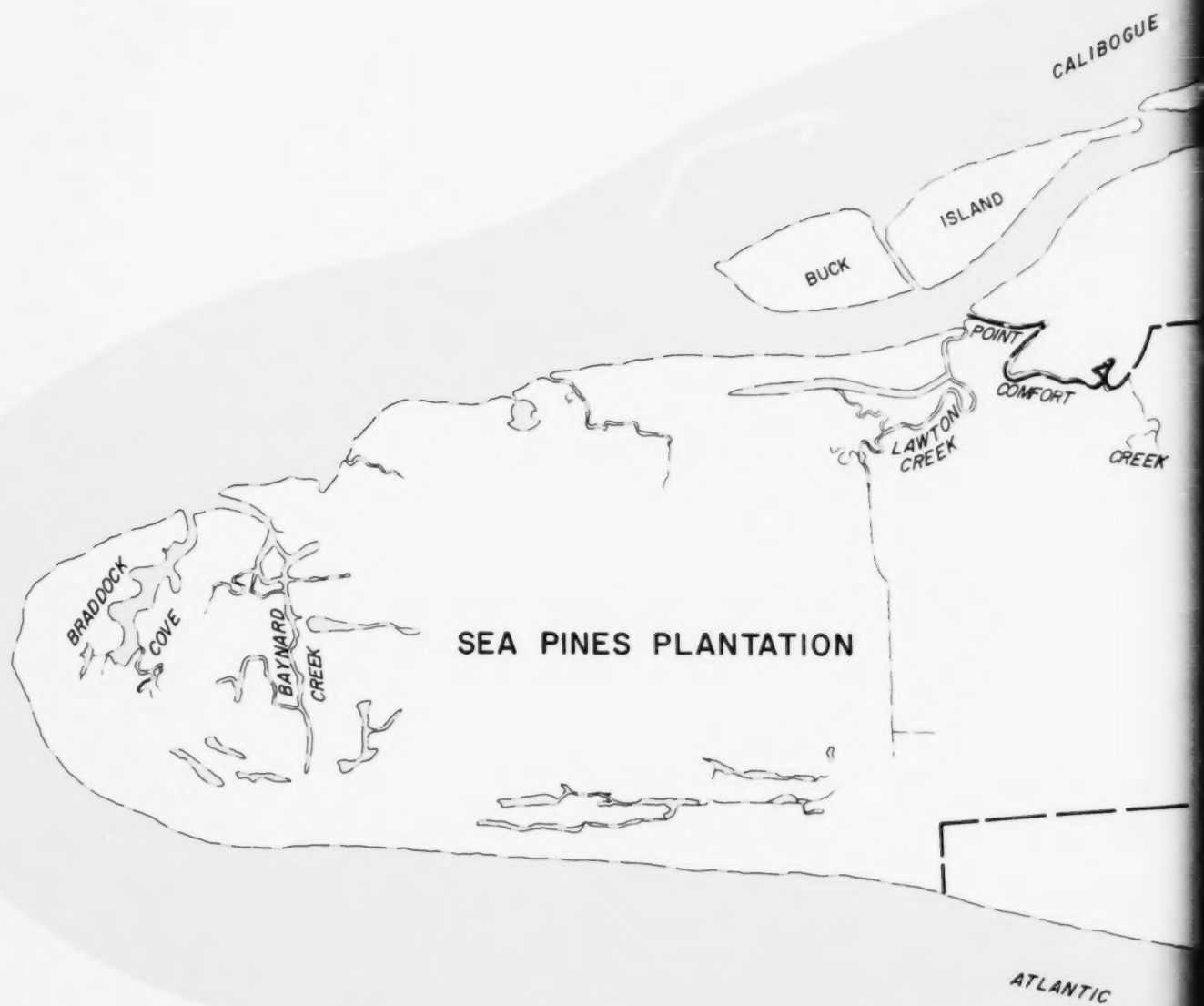
DRIVE

HILTON HEAD AIRPORT

MATTHEWS

PORT ROYAL
PLANTATION







SPANISH WELLS PLANTATION

GARDNER - MATTHEWS PLANTATION

LONG COVE PLANTATION

SHIPYARD PLANTATION

PALMETTO DUNES RESORT

SOUND

JARVIS CREEK

HOUSE CREEK

BROAD CREEK

WILD

MARSHLAND

U.S. ROUTE 278

PALMETTO BAY ROAD

POPE AVENUE

SEA PINES CIRCLE

COLIGNY CIRCLE

OCEAN

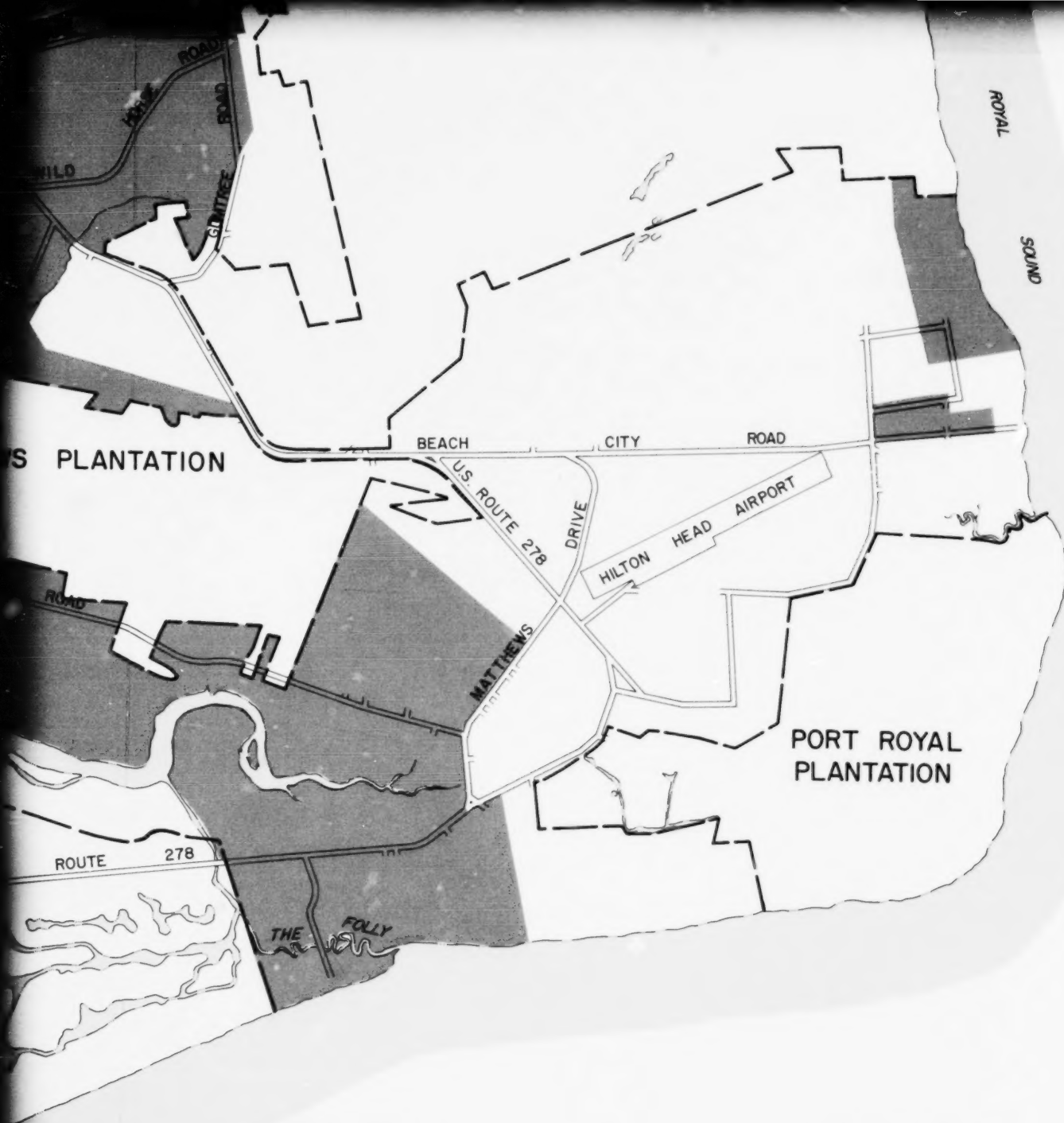


PLATE III - 3

HILTON HEAD ISLAND
SOUTH CAROLINA

PLANTATION LANDS AND
GENERALIZED
HEIRS PROPERTY



SCALE IN FEET

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION IV ATLANTA, GEORGIA

TABLE III-5
HILTON HEAD ISLAND
EXISTING AND KNOWN PLANNED COMMERCIAL
ACREAGE AND ESTIMATED RETAIL FLOOR AREA

<u>Type of Development</u>	<u>Commercial Acreage</u>	<u>Estimated Floor Area (Square feet)</u>
Existing	318.5	1,433,250
Known Planned	256.5	1,154,250
TOTALS	575.0	2,587,500

Source: Beaufort Joint Planning Commission development files and projections, 1981.

LEGEND

	RESIDENTIAL
	OPEN SPACE / RECREATIONAL
	COMMERCIAL / INSTITUTIONAL
	FOREST / AGRICULTURAL
	PRIVATE BEACHES / MARSHES





PINCKNEY ISLAND

JAMES F. BYRNES
BRIDGE

SKULL CREEK

JARVIS CREEK

ROUTE 1

OLD

HOLLY

CREEK

SOUND

ALIBOGUE

WELLS

BROAD CREEK

ROAD



PINCKNEY ISLAND

PORT ROYAL SOUND

BEACH

CITY

ROAD

US ROUTE 278

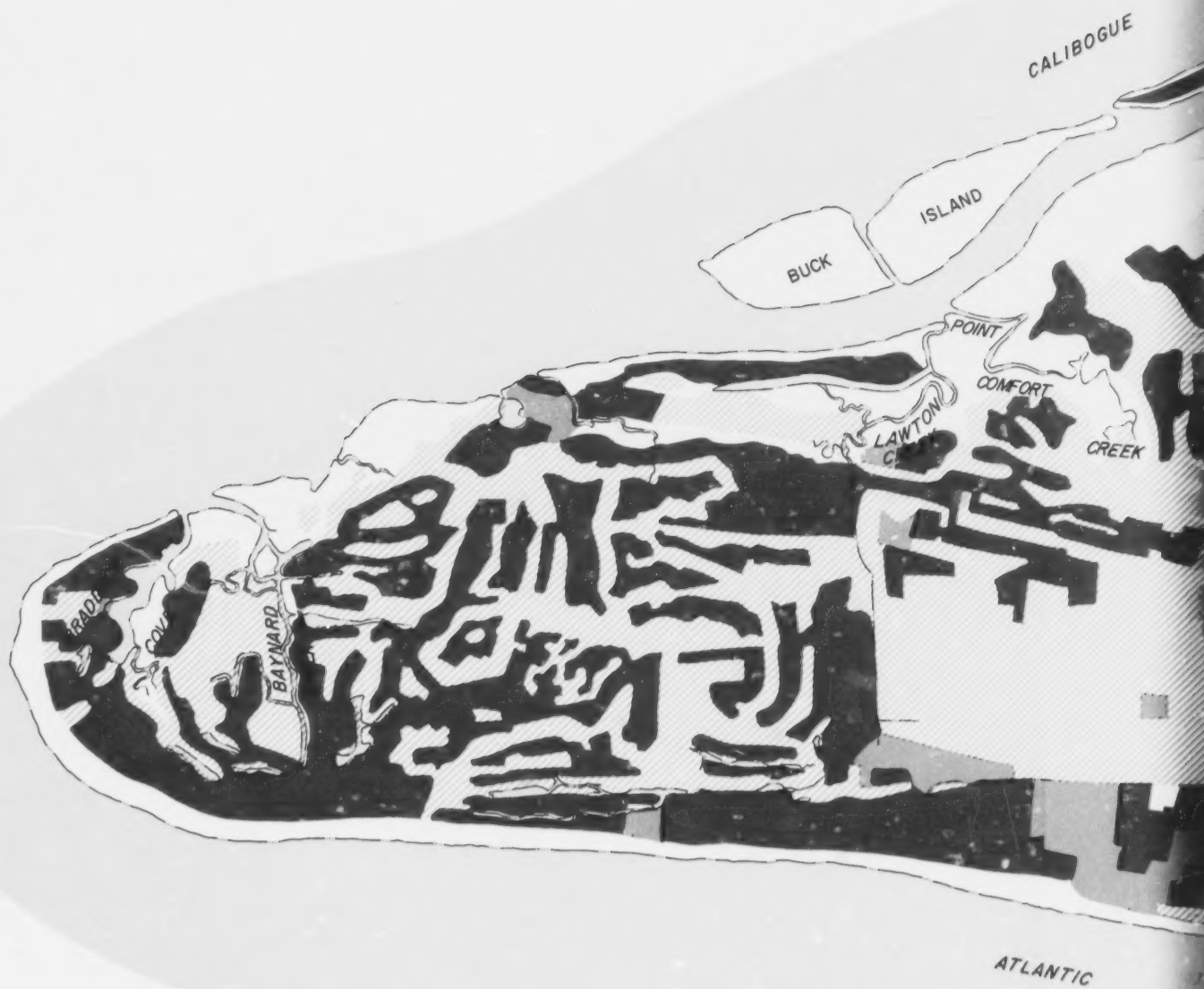
DRIVE

HILTON HEAD AIRPORT

ROAD

MA







CALIBOGUE

SOUND

JARVIS CREEK

ROUTE

OLD

HOLLY

CREEK

SWAMP

WELLS

BROAD CREEK

ROAD

PORT CREEK

PALMETTO BAY ROAD

SEA PINES CIRCLE

POST AVENUE

COUNTRY CIRCLE

U.S. ROUTE 278

ANTIC

OCEAN



PLATE III - 4

HILTON HEAD ISLAND
SOUTH CAROLINA

FUTURE LAND USE

3000 0 3000 6000



SCALE IN FEET

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION III ATLANTA, GEORGIA

TABLE III-6
HILTON HEAD ISLAND
EXISTING, KNOWN PLANNED, AND ESTIMATED ISLANDWIDE
BUILD OUT OF RESIDENTIAL AND HOTEL
CONSTRUCTION(1)

<u>Type of Dwelling</u>	<u>Existing</u>	<u>%</u>	<u>Known Planned</u>	<u>Estimated</u>	<u>Total Build Out</u>	<u>%</u>
Single Family	4,461	(33.5)	8,623	4,025	17,109	(29.7)
Multiple Family	7,289	(54.8)	16,265	14,441	37,995	(66.0)
Hotel Rooms	1,557	(11.7)	894	---	2,451	(4.3)
TOTAL	13,307	(100.0)	25,782	18,466	57,555	(100.0)

(1) Based on master plans or plats approved by JPC. Does not include existing 823 units of manufactured housing.

Source: Beaufort Joint Planning Commission development project files and projections, 1981.

Hilton Head Island is part of unincorporated Beaufort County and subject to the County's development controls. The Cities of Beaufort and Port Royal have adopted zoning ordinances, but the County has not. Currently, there is no zoning on Hilton Head Island.

The nature and the pace of future land use development on the island is essentially left to market forces. This will continue to be the case until local government completes the land use planning process and initiates meaningful development controls. The removal of wastewater treatment and disposal as a constraint to development in the Sea Pines - Forest Beach area would have a significant impact upon the conversion of undeveloped land to more urban land uses. The implementation of any of the alternatives would support development patterns as shown in Plate III-4. Market conditions may lead to pressures for higher density land uses than those forecast in the future land use plan. The wastewater disposal alternatives involving surface discharges would lend themselves most to increasing capacities in the future. Increased plant capacity, pumping capability through the outfall and increased NPDES permit limitations would be required. Increased land use densities would be harder to support under the land application alternatives due to the need to buy more land. This would be especially true if the on-island land application alternative is selected due to the constantly increasing land costs and decreasing availability of land. Land is cheaper and more available off-island. However, extensive pumping costs are involved which would increase with the distance from the island. This distance can be expected to increase as development near the island increases.

The portion of the Sea Pines - Forest Beach area most sensitive to future development pressure is the oceanfront in Forest Beach. More hotel-motel and residential high-rise development will be constructed as market conditions allow. No land use controls currently exist which would stop this type of development nor the 1300 wheeled-in modular stacked units on the beachfront north of Palmetto Dunes Resort.

The method of disposal selected for Sea Pines will also impact land use in other areas of the island. The implementation of a surface discharge alternative would set a precedent for a similar discharge into Port Royal Sound. This would make it easier for developers to build at higher densities without being concerned with adequate land being available for spray irrigation. This will be especially true for the many small land holders in the northern part of the island who would be heavily impacted by wastewater disposal constraints due to their lack of readily available land and capital.

2. ECONOMICS

Implementation of any of the alternatives will support extensive economic activity throughout the 20-year planning period. The expected continued high growth rate will especially benefit the construction and real estate industries. An increased variety and number of job opportunities will be present for those people already living on the island. The lack of affordable housing for low and moderate income groups will increase the number of off-island employees who will require higher salaries to offset commuting costs.

The loss of employment in the shellfishing industry due to closing of beds resulting from non-point source pollution will continue unless appropriate non-point source control measures are implemented. The alternative making Federal funding contingent upon the development of a plan to control non-point source pollution would encourage the solution of this problem. The surface discharge alternatives have the greatest potential for supporting development beyond the projected year 2000 population. This would increase the magnitude of the impacts discussed in this section.

3. TRANSPORTATION

If population projections are accurate, the capacities of the roadway systems on Hilton Head will be exceeded well before the year 2000, based upon evaluations presented in the "1975 Hilton Head Island Thoroughfare Plan" prepared for the Beaufort County Planning Commission. The projections in the report consider total population, including both year-round population and visitor or seasonal population.

Based upon projected average daily traffic volumes, the following conclusions were reached:

- Capacity of a proposed four-lane bridge over Skull Creek (first two lanes now under construction) will be reached in approximately 1995 or soon thereafter.
- Capacity of the four-lane divided Highway 278 (now existing) will be reached in mid-1980's.
- Traffic patterns on Pope Avenue and Sea Pines and Coligny Circles will be subject to increasing congestion as commercial development continues.

Three alternatives were presented for alleviating the Highway 278 conditions. These included (1) upgrading of Highway 278 to a six-lane at-grade divided highway; (2) upgrading of existing four-lane Highway 278 to a freeway/parkway with on/off ramps to provide for limited access; or (3) construction of a new four-lane highway across Hilton Head Island which would depart from Highway 278 near Spanish Wells Road, overpass Spanish Wells and Otter Hole Roads, cross Broad Creek, and terminate at Palmetto Bay Road.

In addition to the future improvements needed for the major arterial network, there is an existing need to upgrade the unpaved roads which serve the rural communities outside the plantations. Residents of these areas are concerned about the lack of progress in improving these roads and installing adequate drainage facilities to prevent localized flooding from heavy rains. Lack of traffic signals at congested intersections and increasing intermodal conflicts between vehicle, bicycle, and pedestrian traffic are other areas of concern that must be resolved not only for future traffic conditions, but also for existing conditions.

In summary, based upon 1975 studies and more recent analyses, the population projected for the year 2000 and the associated increase in traffic will

overload the existing highway network on Hilton Head Island. The timing of required improvements must be periodically reviewed in light of actual population increases and resulting traffic.

The surface discharge alternatives have the greatest potential for supporting development beyond the projected year 2000 population. This would increase the magnitude of all the impacts discussed in this section. The greater potential densities allowable under these alternatives would create more localized bottlenecks as well as more islandwide congestion. The lower densities which would result under the land application alternatives should mean less congested traffic intersections as well as less ultimate overall island traffic.

4. COMMUNITY SERVICES AND FACILITIES

The anticipated growth on Hilton Head Island will place an increased demand on community facilities and services. Currently, fire protection, libraries, and health care are considered fully adequate. Therefore, the expansion of these services to meet new levels of population needs only to be made in proportion to population gains. However, concern has been expressed over the adequacy of public education facilities, police protection, and public recreational opportunities.

Public education is presently deemed inadequate. A \$16.25 million county-wide school bond issue was authorized in early 1980; \$8 million of the bonds were sold in late 1981. The remaining \$8.25 million is scheduled for sale in March of 1982. Opening of the new school is now expected in the fall of 1983. The inadequate quality of education as well as the physical condition of school facilities has been a major issue in the community. The majority of new island residents will belong to upper income groups. Their expectations as to what constitutes high quality public education will cause per capita spending and individual taxes to increase in order for their requirements to be met.

Police protection is also considered unsatisfactory at present. Although more deputies have been added to the Beaufort County Sheriff's Department in 1980, islanders remain concerned about steadily rising crime rates, traffic conditions, and congestion. These trends will continue in the face of rapid urbanization unless service levels are increased significantly. Thus individual taxes can be expected to increase to cover the costs of new buildings, equipment, and personnel.

Although the development of Hilton Head Island has been resort-oriented since the early 1950's publicly-financed facilities on the island do not meet the needs of those who cannot afford private recreation opportunities. For example, the island contains no public golf courses, no public gymnasiums, and no public campground. Limited access and support facilities have affected the use of public beach areas. Population increases will generate a demand for additional marinas. Both the construction and operation of marinas can cause significant adverse environmental impacts without the implementation of proper controls addressing initial and maintenance dredging, the flushing of bilges and sanitary facilities, fuel spills, litter control around concessions, etc. Water quality degradation and loss of aquatic habitat are major areas of impact.

In summary, the significantly expanding island population will demand an increase in the quantity of all services and in the quality of selected services. Pressures are now mounting for either greater responsiveness to island needs from Beaufort County or some alternative form of government. Since island population is projected to increase more rapidly than other districts in the county, these pressures are expected to continue. Increased local taxes will almost certainly result from any significant expansion in services and facilities.

These needs in expansion of services and facilities discussed above will result from the projected JPC population forecast for the year 2000 which will be supported by all the alternatives being evaluated. The lack of land use controls means that the rate of development under any alternative will be controlled by market forces rather than geared to the provision of adequate services and facilities. This will drive up the cost to local government to pay for the additional services and facilities.

Additional impacts to Hilton Head community services and facilities would result if greater population levels than those in the JPC projections are realized. These higher levels would be more easily attainable if the surface water discharge alternatives were chosen for the reasons discussed in the introductory section of this chapter. Very crowded conditions could be the result of higher population levels with higher taxes necessary to correct these conditions.

5. WATER QUALITY

Recent water quality studies by DHEC have confirmed that non-point source pollution of the Lawton Creek - Broad Creek waters is significant. Sub-standard water quality conditions have been shown to be attributable in large part to bacterial contamination from non-point source runoff. These water quality problems will persist until such time as effective non-point source controls are implemented. Adjacent water bodies such as Point Comfort Creek, Baynard Creek, and Braddock Cove are vulnerable to the same problems in the near future as the southern end of the island maintains its existing development momentum.

The waters of Jarvis Creek, Old House Creek, Skull Creek, and Fish Haul Creek are also susceptible to non-point source pollution as the northern end of the island develops. Little is presently known about water quality in these creeks. Unless baseline studies are conducted in the near future while these areas are relatively undeveloped, public agencies will not be able to assess the significance of future water quality changes and take action to control specific sources of pollution.

Unless appropriate non-point controls are implemented, additional closures of SA waters can be expected as development proceeds on the island. Those alternatives allowing the greatest ultimate population density have the potential for causing greater adverse impacts to the SA waters. Therefore, the surface water discharge alternatives offer the greatest potential for adverse impacts to water quality due to greater quantities of runoff generated than the land application alternatives.

The only alternative which encourages any improvement in the non-point source situation is the Federal funding conditional on non-point source solution alternative. As part of the alternative, no Federal funds would be provided to Sea Pines PSD unless action is taken to mitigate the non-point source problems in that area.

PART D. MITIGATIVE MEASURES

Measures are suggested below to mitigate the adverse impacts which have been previously identified. Most of these measures are the responsibility of the local government in Beaufort County.

1. SURFACE WATER QUALITY

- Use of alternate means of disinfection to chlorination if a disposal to surface waters is selected.
- Development of a more extensive water quality baseline of the entire island so that data exist against which to measure future water quality changes and assess significance of changes. A more active water quality role by DHEC is required.
- Renovation of known failing septic fields, early identification of incipient failures, and proper installation of future on-lot systems. More supervision and enforcement of regulations by the County Health Department is required.
- Better buffering of surface water bodies from lawns and other areas which receive applications of herbicides, pesticides, and fertilizer.
- Control of runoff from horse pastures and other animal confinements.
- Improved litter control and solid waste management.
- Control of discharges from bilges and sanitary facilities of commercial and pleasure boats, particularly within estuarine and marine waters. More stringent enforcement of Coast Guard regulations.
- A policy by local regulatory bodies to discourage the construction of new marinas in shellfish waters.
- Consideration of using naturally occurring wetland areas to receive and assist in renovation of urban runoff.
- Implementation of future recommendations of the Hilton Head Island 208 Non-Point Study and the Hilton Head Land Use Plan.

2. SURFACE WATER QUANTITY

- Requirements for on-site detention in new developments.
- Relief of localized flooding of unpaved roads at the north end of the island. Drainage improvements should be made by the County Public Works Department. Such activity should be planned very carefully as additional non-point source pollution may result.

3. GROUNDWATER QUALITY AND QUANTITY

- Continued expressions of interest by local community officials and citizens in the development and findings of the Corps of Engineers' Savannah Areawide Study which addresses the regional drawdown of potable water supplies.
- Implementation of a water conservation program via public education and changes to the plumbing code so as to decrease demand on the groundwater resource.

4. TERRESTRIAL ECOSYSTEMS

- Vegetative survey on-site if spray irrigation alternative is selected.
- Enforce regulations of the U. S. Army Corps of Engineers, the South Carolina Coastal Council, and the Beaufort County Development Standards Ordinance which restrict the development of wetlands, oceanfront beaches and primary dunes.
- Utilize boardwalks for access in developed beach zones.
- Strengthen the Development Standards Ordinance until such time as it is replaced by a Land Use Plan.
- As new plantations are developed, encourage measures such as nature preserves/conservancies, greenbelts, buffer zones, and tree ordinances which help maintain natural habitat conditions.
- Minimize unnecessary clearing of trees and other vegetation in developed areas.

5. AQUATIC ECOSYSTEMS

- Protection of wetlands and waters by existing legislation as well as avoidance of lowering water levels by alteration of natural drainage patterns.

- Control of leachate from dredge spoil.
- Implementation of previously discussed mitigative measures affecting surface water quality.

6. POPULATION

- Implementation of local controls to plan population densities on the island consistent with local community development goals.

7. LAND USE

- Strengthening of the Development Standards Ordinance to control building densities within a site and to promote the provision of open space.
- Adoption of a Land Use Plan to control strip development along Highway 278, regulate densities, buffer incompatible land uses, and regulate nuisances.

8. CULTURAL RESOURCES

- Archeological survey of land impacted by selected alternative.
- Control of non-point runoff as described under Surface Water Quality to protect shellfish supplies.
- Support of fishing coops and other programs to broaden shellfish markets.

9. RECREATION

- A more active role by citizens and island representatives in the preparation of the County's capital budget to provide for public recreation.
- Cooperation between JPC staff and oceanfront developers to provide public access easements to beaches where possible.
- Control of non-point runoff as described under Surface Water Quality.

10. TRANSPORTATION

- Consideration of a public transportation system.
- Upgrading of unpaved county roads.
- Provision of bikeway systems and sidewalks.
- Increased and more efficient signalization.
- Initiation of Mackay Creek Bridge improvements.

11. COMMUNITY SERVICES AND FACILITIES

- Coordination of detailed community facilities planning with controls of rate of population increase and land use planning.
- Adequate funding of island needs by county government or an alternate form of government.
- Hiring of additional Sheriff's Deputies.
- Neighborhood watch programs and other citizen self-help efforts for crime prevention.
- Implementation of the Rural Water Authority proposal to improve fire protection services.
- Greater enforcement of regulations against illegal construction dumps.
- Expanded pick-up services for trash and garbage collection.

CHAPTER IV
DESCRIPTION OF THE PREFERRED
ALTERNATIVE

PART A. INTRODUCTION

The purpose of this EIS is to select a wastewater management program for Hilton Head Island that is compatible with the protection of the area's sensitive resources, particularly water quality. At the same time, the selected alternative must consider the extensive development pressures on the island and their potential impact on the natural and manmade environment.

The EIS has determined that discharge to Calibogue Sound, spray irrigation on-island, and spray irrigation off-island are all environmentally acceptable alternatives for the Sea Pines PSD - Forest Beach PSD. Also, during the course of the EIS, extensive analysis of water quality data indicated that non-point source pollution from stormwater run-off is a severe problem.

In light of these findings, EPA has decided to condition Federal funding of the most cost-effective disposal alternative that can be implemented locally upon the development of a non-point source control program within the two PSD's.

PART B. SEA PINES PSD - FOREST BEACH PSD

The preferred wastewater management program for Sea Pines PSD - Forest Beach PSD is the most cost-effective, implementable alternative of the three environmentally acceptable disposal options - discharge to Calibogue Sound, spray irrigation on-island at Gardner-Matthews, or spray irrigation off-island. Permits issued by the Army Corps of Engineers, the Coastal Council, and DHEC would be necessary for the Calibogue Sound alternative to be implementable. Implementation of any one of these alternatives will remove the existing discharge from Lawton Canal thereby eliminating the need to enlarge the required buffer zone for shellfishing and eliminate the need to rely upon rapid infiltration as a land application technique thus minimizing impacts to the groundwater.

Construction of wastewater facilities (Step III) would be eligible for Federal funding if an effective non-point source program were developed and implemented for the Sea Pines PSD - Forest Beach PSD area by the time the Step II design phase was complete.

Detailed studies will be required during Step II to determine the optimal location and orientation of the outfall/diffuser structure into Calibogue Sound. If either of the spray irrigation alternatives are implemented, site specific studies will be required to determine the layout of the system and recommended application rates.

If Federal funding is made available for Step III construction, facilities sized to handle the 1.8 mgd now being discharged into Lawton Canal would be eligible. Any additional disposal capacity constructed would have to be funded entirely at the local level, in accordance with Federal and State funding procedures.

1. DESCRIPTION OF ALTERNATIVE

New facilities which would be required for each of the three environmentally acceptable wastewater management alternatives are summarized in Table IV-1. Treatment will be afforded by the Sea Pines PSD plant which is now being expanded to 3.25 mgd with 100 percent local funding. Irrigation of all five golf courses within the PSD's and the wetlands discharge system which has already been approved in concept by the South Carolina DHEC and Coastal Council will be used to the extent possible. Construction of these facilities is being carried out entirely with local funds.

Sizing of the new facilities would be determined by the Sea Pines PSD - Forest Beach PSD based upon their projection of ultimate build-out. Current projections of the two PSD's indicate the need for an ultimate wastewater treatment plant capacity of 5.0 mgd. However, any EPA participation in funding required wastewater facilities would be limited to disposal facilities sized to handle the 1.8 mgd now being discharged into Lawton Canal.

2. COSTS

Cost information for the Calibogue Sound discharge, on-island spray irrigation at Gardner-Matthews, and off-island spray irrigation were previously presented in Tables II-8, II-10, II-11, II-12, II-14, and II-15. A summary is provided below.

Alternative	Net Present Worth	Estimated Increase in Annual User Cost	
		EPA Funding	No EPA Funding
Calibogue Sound	\$ 1,818,300	\$ 16.75	\$ 40.69
Spray Irrigation	\$12,609,000	\$117.26	\$296.50
at Gardner-Matthews			
Spray Irrigation	\$12,576,100	\$108.59	\$277.26
Off-Island			

TABLE IV-1
SEA PINES PSD - FOREST BEACH PSD
DESCRIPTION OF FACILITIES REQUIRED
FOR ENVIRONMENTALLY ACCEPTABLE ALTERNATIVES

DISCHARGE TO CALIBOGUE SOUND	LAND APPLICATION ON-ISLAND AT GARDNER MATTHEWS	LAND APPLICATION OFF-ISLAND
- Pumping facilities at the Sea Pines PSD plant; - Over 18,500 feet of force main from the plant through Sea Pines Plantation and across South Beach (alignment of force main to be determined during Step II design in order to minimize utility conflicts and traffic disruptions); and - Over 4,000 feet of subaqueous outfall plus multi-port diffuser for discharge of treated wastewater into Calibogue Sound.	- Pumping facilities at the Sea Pines PSD plant to convey treated wastewater to the Gardner-Matthews site; - Over 54,000 feet of force main from the plant along Pope Avenue, Route 278, Matthews Drive, and Marshland Road to the site; - Purchase of sufficient acreage at the Gardner-Matthews site to accommodate wastewater quantities in excess of golf course irrigation needs (estimated at over 500 acres to provide for spray area of approximately 305 acres plus adequate buffer area); - Construction of a solid-set spray irrigation system at the Gardner-Matthews site to provide for land application; and - Construction of an 8-acre, 23 million gallon storage pond at the site.	- Pumping facilities at the Sea Pines PSD plant to convey treated wastewater off-island to Union Camp property (or to other suitable sites that are available); - Over 122,000 feet of force main from the plant along Pope Avenue, Route 278, across Skull Creek and Mackay Creek, and Route 278 on the mainland to the site; - Booster pumping station sited at optimal location along force main route; - Purchase or long-term lease of sufficient acreage at the Union Camp property to accommodate wastewater quantities in excess of golf course irrigation needs (estimated at over 500 acres to provide for spray area of approximately 305 acres plus adequate buffer area); - Construction of a solid-set spray irrigation system at the site to provide for land application; and, - Construction of an 8-acre, 23 million gallon storage pond at the site.

3. IMPLEMENTATION

Implementation of the Calibogue Sound discharge will require permits from the Coastal Council, Army Corps of Engineers, and an NPDES Permit from DHEC.

Either of the two spray irrigation alternatives require that land outside the boundaries of the Sea Pines PSD and the Forest Beach PSD be obtained either through outright purchase or condemnation. Based on current information, neither Sea Pines PSD nor Forest Beach PSD has the power to purchase or condemn land outside their respective boundaries. A recent opinion from the Office of the South Carolina Attorney General indicates that the condemnation authority of Beaufort County can be used to assist the PSD's in obtaining land for spray irrigation. In-depth investigations will be required to determine the best approach regarding ownership, management, and institutional arrangements as they involve the County, the Sea Pines PSD, and the Forest Beach PSD.

As previously noted, EPA funding of the preferred alternative for the Sea Pines PSD - Forest Beach PSD is dependent upon the development of a non-point source control program within the PSD's. Under their present structure, neither the Sea Pines PSD nor the Forest Beach PSD has the authority to initiate or implement non-point source management programs. Implementation of such a program will require the establishment of a new agency with appropriate authority, or enactment of additional legislation by the Beaufort County Council.

4. SPECIAL STUDIES

If the Calibogue Sound alternative is implemented, detailed studies will be required during Step II design to determine the optimal location and orientation of the outfall/diffuser structure into Calibogue Sound. These studies should develop outfall and diffuser designs; alignment and depth of discharge; and effluent plume location, mixing, and dilution.

If either of the spray irrigation alternatives are selected, detailed field investigations will be needed to establish the physical, hydraulic, and chemical properties of the soil. Groundwater depths must be determined, and site inspections conducted to assess the existing vegetation and topography. A monitoring program will be required to determine permissible loading rates.

PART C. OTHER PSD'S

As previously indicated, the other PSD's are not eligible for Federal funding based upon the OBERS funding formula. Therefore, any additional wastewater facilities constructed by these PSD's (including Hilton Head Plantation) must be done with 100 percent local funding. If proper planning is undertaken now by these PSD's, wastewater facilities should be available to meet future needs.

Septic tank-drainfield systems remain the preferred alternative for the non-PSD areas where soils, groundwater depth, and site conditions are acceptable. Solutions and costs for areas which experience malfunctions in the future will depend on the extent of the problem area, the affected population, and development plans for contiguous areas.

PART D. MITIGATIVE MEASURES

This section discusses activities which can reduce the magnitude of adverse primary impacts from whichever Sea Pines PSD - Forest Beach PSD alternative is implemented, as well as those activities which, if implemented by local governing bodies, can reduce the secondary impacts caused by the continued development of Hilton Head.

1. MITIGATIVE MEASURES FOR PRIMARY IMPACTS

Elements of the environment which are expected to be most greatly affected include surface water quality, groundwater quality, terrestrial ecosystems, and aquatic ecosystems. Measures which can be instituted during the design, construction, and operation phases of the preferred alternatives for the Sea Pines PSD - Forest Beach PSD to reduce the magnitude of adverse impacts to the environment are discussed below.

Surface Water Quality. Any water quality impacts which would result from a discharge to Calibogue Sound can be further lessened from optimal location and orientation of the diffuser structure based upon detailed current and circulation studies. Potential chlorine toxicity problems from a Calibogue Sound discharge can be avoided through dechlorination or the use of alternate methods of disinfection.

Groundwater Quality. Judiciously placed groundwater monitoring wells of varying depths can be used to determine impacts that might occur from either of the spray irrigation alternatives. In the event that significant impacts were determined, application rates could be lessened.

Terrestrial Ecosystems. Either of the spray irrigation alternatives will result in impacts to terrestrial ecosystems. These impacts can be lessened through conducting detailed site investigations so that sensitive environmental areas can be located prior to layout of the woodlands irrigation system. Any wetlands areas can thus be avoided, as well as any nesting colonies. Baseline vegetational and wildlife conditions should be established prior to system operation so that possible shifts in species composition can be identified.

Construction of the pipeline crossing of South Beach for the Calibogue Sound outfall should be scheduled to avoid the nesting season for least terns (April - July) and for loggerhead turtles (late May - August).

Aquatic Ecosystems. Any impacts of a wastewater discharge to Calibogue Sound will be considerably lessened through either dechlorination or by using other methods of disinfection. For such a discharge, water quality and biological monitoring programs should be established so that impacts of the discharge can be assessed. Water quality monitoring would require that permanent stations be established in the vicinity of the discharge point and that samples be taken at regular frequencies. Biological monitoring could be accomplished through means such as continuous, flow-through bioassays and the placement of live boxes near the point of discharge.

Monitoring of the experimental wetlands discharge system which is already being implemented should be accomplished in order to determine possible impacts.

2. MITIGATIVE MEASURES FOR SECONDARY IMPACTS

Non-point source pollution from continued development will impact the island's water quality. Problems will grow continually worse if control measures are not initiated now before development intensifies. Land use regulation and implementation of non-point source controls such as on-lot retention and treatment through natural wetlands systems could significantly mitigate non-point source problems.

As previously indicated, EPA funding of wastewater facilities for the Sea Pines PSD - Forest Beach PSD will be contingent upon development of appropriate non-point source controls to alleviate existing problems and prevent future problems within the PSD's. The 208 Non-Point Source Study, now underway, is expected to recommend control measures for non-point source pollution. Many of the recommendations will undoubtedly require that Beaufort County take a firm position and require more stringent development controls through additional legislation. These controls should be in effect for all development on the island.

In addition, the Land Use Plan now being developed by the Beaufort County Joint Planning Commission should be responsive to the needs of the island, particularly in the planning for areas which lie outside the plantation boundaries such as the Folly Field area, Forest Beach, and the Route 278 corridor. Additional controls may need to be implemented to enforce the recommendations of the plan in order to mitigate the impacts related to population growth of the island. More detailed community facilities planning and capital budgeting by Beaufort County would likely be required to support the land use and population projections in the land use plan.

The following are among the many measures which could be implemented to lessen the impacts of future population growth on the natural and man-made environment of Hilton Head. Most of these measures are the responsibility of the local government in Beaufort County. The County should move to implement these actions as soon as possible.

1. Surface Water Quality

- Development of a more extensive water quality baseline of the entire island so that data exist against which to measure future water quality changes and assess significance of changes. A more active water quality role by DHEC is required.
- Consideration of using wetlands for urban runoff treatment.
- Control of discharges from bilges and sanitary facilities of commercial and pleasure boats, particularly within estuarine and marine waters. More stringent enforcement of Coast Guard regulations.
- A policy by local regulatory bodies to discourage the construction of new marinas in shellfish waters.
- Implementation of future recommendations of the Hilton Head Island 208 Non-Point Study and the Hilton Head Land Use Plan related to water quality.

2. Surface Water Quantity

- Relief of localized flooding of unpaved roads at the north end of the island. Drainage improvements should be made by the County Public Works Departments. Such activity should be planned very carefully as additional non-point source pollution may result.
- Implement future recommendations of Hilton Head Island 208 Non-Point Study which will not have an adverse effect upon water quality.

3. Groundwater Quality and Quantity

- Continued expressions of interest by local community officials and citizens in the development and findings of the Corps of Engineers' Savannah Areawide Study which addresses the regional drawdown of potable water supplies.

- Implementation of a water conservation program via public education and changes to the plumbing code so as to decrease demand on the ground-water resource.

4. Terrestrial Ecosystems

- Enforce regulations of the U. S. Army Corps of Engineers, the South Carolina Coastal Council, and the Beaufort County Development Standards Ordinance which restrict the development of wetlands, oceanfront beaches and primary dunes.

- Strengthen the Development Standards Ordinance until such time as it is replaced by a Land Use Plan.

5. Aquatic Ecosystems

- Implementation of previously discussed mitigative measures affecting surface water quality.

6. Population

- Implementation of local controls to plan population densities on the island consistent with local community development goals.

7. Land Use

- Strengthening of the Development Standards Ordinance to control building densities within a site and ensure provision of adequate open space.

- Adoption of a Land Use Plan to control strip development along Highway 278, regulate densities, buffer incompatible land uses, and regulate nuisances.

8. Recreation

- A more active role by citizens and island representatives in the preparation of the County's capital budget to provide for public recreation.

- Cooperation between JPC staff and oceanfront developers to provide public access easements to beaches where possible.

9. Transportation

- Upgrading of unpaved county roads.
- Provision of bikeway systems and sidewalks.
- Increased and more efficient signalization.

10. Community Services and Facilities

- Coordination of detailed community facilities and capital budgeting with land use planning.
- Adequate funding of island needs by county government or an alternate form of government.

CHAPTER V - EIS COORDINATION

PART A. INTRODUCTION

The purpose of this chapter is to document the interaction and communications between EPA and its consultants with affected publics in the study area. A wide variety of mechanisms have been employed: public hearings, a Review Committee, informal small group meetings with officials and private groups, letters, telephone calls, newspaper/radio/TV interviews, and various types of handouts. An effort has been made to solicit input from a wide spectrum of community interests, to keep each group informed of study progress, and to bring together conflicting points of view.

The first sections of this chapter document concerns raised by public bodies and private citizens. Thereafter, the public participation program is described.

PART B. CONCERNS EXPRESSED BY OTHER PUBLIC AGENCIES OR INSTITUTIONS

A number of concerns have been expressed by state and local officials as well as staff and commissioners of the Public Service Districts. This section of Chapter V describes the major contributions and interests of each group.

1. STATE AGENCIES

The South Carolina Wildlife and Marine Resources Department has expressed concern with any disposal alternative which would result in a discharge to the marine environment. The Department not only fears potential impacts but also the precedent that such a determination might set. Areas of concern include salinity alterations, changes in the species composition of the phytoplankton community due to nutrient loadings, dissolved oxygen depletion, and the toxic effects of chlorine and ancillary pollutants.

The South Carolina Coastal Council has also expressed reservations regarding the discharge of treated wastewater into Calibogue Sound. The Council is concerned regarding the proliferation of outfalls into marine waters, potential impacts on aquatic ecosystems, and the conflict with the proposed mariculture facility to be located at Victoria Bluff.

The South Carolina Department of Health and Environmental Control is charged with the monitoring and the preservation of the SA (shellfishing) designation of the waters surrounding Hilton Head Island. These waters include

Lawton Creek, Broad Creek, Calibogue Sound, and Port Royal Sound. The Class SA standards for shellfishing are very stringent and difficult to maintain. For this reason, DHEC does not favor the discharge of treated wastewater to shellfish waters where viable alternatives exist.

2. REGIONAL PLANNING AGENCY

The Low Country Council of Governments has stated that local government must determine its objectives regarding land use and population and respond accordingly.

3. LOCAL GOVERNMENT

Beaufort County has supported a coordinated approach to the study of water supply, non-point source pollution and wastewater (point source) management. The county is coordinating the 208 study. The major emphasis of this study is the identification of drainage patterns, water quality sampling, and the development of measures to control stormwater runoff.

4. PUBLIC SERVICE DISTRICTS

The following concerns have been raised during the course of the EIS by representatives of one or more of the PSD's.

- Irrigation of golf courses with treated wastewater cannot be the only alternative available to the PSD's. Backup alternatives are required for use during rainy periods, during periods when the quantity of wastewater seasonally exceeds golf course needs, and in cases where there are not enough golf courses to handle projected wastewater flows.

- The EIS consultants have projected wastewater flows based on future population assuming less than 100 percent occupancy rates. DHEC requires that the PSD's project wastewater flows in terms of gallons per day per bedroom of future dwelling units which assumes 100 percent occupancy.

- The PSD's project higher wastewater flows than the EIS, attributable in part to the occupancy rate factor. The differences more drastically impact wastewater management alternatives for the Broad Creek PSD and the Hilton Head No. 1 PSD.

PART C. CONCERNS EXPRESSED BY INDIVIDUALS AND PRIVATE GROUPS

A number of concerns have been expressed by individuals and private groups. Many of these vary significantly from the concerns of public officials as well as from the concerns of other citizens. Some of the major issues identified by individuals and private groups are listed below.

- The EIS should determine the carrying capacity of the island's environment and strictly control growth beyond those limits. The island needs a population cap.
- The EIS should control the non-point source pollution problems on the island.
- The EIS is a waste of taxpayers' money. There is no reason to devise expensive solutions to potential point source problems when it is known that the current problem is non-point source pollution, which can only get worse as the island continues to develop.
- The revenues derived from development and tourism far outweigh the revenues derived from the shellfish industry. Therefore, development should not be unduly constrained in order to preserve SA class waters. Instead, the oysters could be moved elsewhere for depuration.
- Because there is little chance that non-point runoff can be controlled, SA waters should be reclassified to SB, and development should proceed within that framework.
- Population projections should follow historic trend lines rather than OBERS disaggregations. OBERS figures are too low for the three population components computed, and in addition, day visitors and seasonal residents are omitted from OBERS calculations.
- Close liaison should be maintained with the Black Community to ensure adequate consideration of their concerns.
- DHEC should establish a water quality baseline for the northern areas of the island so that degradation trends can be identified as those areas are urbanized.
- Closing of shellfish beds represents not only an economic loss but the destruction of a longstanding way of life in the Black Community.
- Widespread drainage problems have developed on the island as a result of extensive alteration to natural drainage patterns without regard for upstream or downstream impacts. Water levels in the Forest Preserve wetlands have been lowered significantly. Standing water problems are found at the north end of the island which cause road closings and may affect on-lot disposal system efficiencies.

- Questionnaires turned in at the land use and population workshops rated protection of environmental quality as the No. 1 concern of island residents.

PART D. PUBLIC PARTICIPATION PROGRAM

Public participation programs are mandated by federal regulations governing the preparation of Environmental Impact Statements. Public participation is an important and valuable part of the EIS process because it provides for active public involvement in developing and evaluating wastewater management alternatives.

At the beginning of the Hilton Head Island EIS, a public participation program was established to provide opportunities for interested groups, individuals, and government agencies to participate in the development of the EIS. The focal point of this program was the establishment of a Review Committee. This group served in an advisory capacity to EPA and their consultants. Specific functions and duties of the group included:

- Identifying local planning and environmental objectives
- Identifying study area issues and conflicts regarding wastewater management and environmental conditions
- Reviewing all task report submissions
- Assisting in the development and evaluation of wastewater management alternatives
- Reviewing Draft and Final Environmental Impact Statements

The Review Committee met at regular intervals throughout the development of the EIS. In addition, EPA and their consultants met upon request with individual members of the Review Committee or with the groups they represented.

The public participation program included one public scoping meeting, a public workshop conducted in four sessions, three Review Committee meetings, and a public meeting. The Review Committee was composed of 31 public agencies and private organizations. A broad range of community interest was included: state and local government agencies (7), developers (5), homeowners associations (6), trade associations and business groups (4), Public Service Districts (4), and social service and environmental interests (5). Table V-1 lists the members of the Review Committee.

On June 28, 1979, a public scoping meeting was held at the Hilton Head Elementary School to describe the procedures EPA would use in preparing the EIS. The meeting included presentations on the purpose and background of the EIS, the 201 Study, the scope of the EIS and issues to be addressed, the EIS schedule, and a description of the public participation program. Afterward, 15 citizens and officials made comments.

TABLE V-1

EIS REVIEW COMMITTEE

Public Agency

H. Wayne Beam
 Charles R. Jeter/Roger Davis
 J. Luke Hause
 J. Stephen Hopkins
 I. Vincent Hager/Perry White
 Penn Estabrook/Buddy Thompson
 Gordon Craighead

S. C. Coastal Council
 S. C. Dept. of Health & Environmental Control
 S. C. DHEC, Shellfish Division
 S. C. Wildlife & Marine Resources Dept.
 Beaufort Joint Planning Commission
 Low Country COG
 Beaufort County Council

Developers

David Axene/Josh Gold
 Benny K. Jones
 Robert C. Onorato
 William D. Asnip/Bert Newman
 P. Ray Easterlin, Jr.

Hilton Head Company
 Hilton Head Plantation
 Palmetto Dunes Resort
 Sea Pines Plantation Company
 Heritage Properties

Homeowners Associations

William F. Shopmyer
 Elbert Bellows/Emerson Schroeder
 Kenneth J. Gutshaw
 Charles Haussermann
 John D. Hegeman
 Josh Gold

Forest Beach Community Assn.
 Sea Pines Property Owners Assn.
 Assn. of Land Owners of Port Royal Plantation
 Palmetto Dunes Property Owners Assn.
 Spanish Wells Property Assn.
 Shipyard Plantation Property Owners Assn.

Trade Associations and Business Groups

Joe Harden
 Ben Banks
 Robert H. Christian
 Ed Crovo

Home Builders Assn.
 Chamber of Commerce
 Council of Architects
 Hilton Head Hospitality Assn.

Private Groups

Barclay Morrison/Willard Haring
 Judge Buck Smith
 Emory Campbell/Murray Christopher
 Thomas C. Barnwell, Jr.

Rev. Ben Williams

Audubon Society
 Shellfish Interests
 NAACP
 Beaufort/Jasper County Comprehensive Health
 Program and Hilton Head Fishing Cooperative
 Black Community at Large

Public Service Districts

R. Arnold Ellison, Jr.
 T. Kent Langley
 William T. Hunter
 William J. Parker, Jr.

Sea Pines PSD
 Forest Beach PSD
 Broad Creek PSD
 Hilton Head No. 1 PSD

The first Review Committee meeting was held on October 1, 1979 at the First Presbyterian Church to review the EIS Plan of Study and Background Task Report. Questions were raised about the adequacy and findings of the DHEC non-point sampling program to date as well as future sampling efforts. The purpose of the public participation program was discussed and the Committee was asked to confirm if all major issues of the EIS had been identified and incorporated into the work effort.

The format of the first Review Committee meeting and all subsequent ones consisted of a presentation by the EIS consultants. The Committee was then divided into three round table discussion groups. At the end of the evening, a representative from each table summarized the discussion for the benefit of the other participants and observers.

A meeting was held with the NAACP Board on October 2, 1979 to define the approach that the EIS consultants should take in documenting the scope of the local shellfishing industry. Arrangements were made to introduce the consultants to key persons. Other community development problems were discussed including wastewater management and provision of other public services, land use, drainage, and water supply.

A public workshop was conducted in four sessions on December 5-6, 1979 at the First Presbyterian Church to address the EIS findings regarding population, land use, and the local shellfishing industry. Over 80 persons attended, including Review Committee members, the general public, and representatives of shellfishing interests. At the conclusion of each workshop, participants were asked to complete and return a brief questionnaire. A majority of those responding indicated that they considered preservation of the island's environmental quality to be high priority, and over three-quarters indicated that they were willing to pay more for wastewater management to protect the shellfish industry. WJWJ-TV filmed portions of the workshop and interviewed the EIS consultants in order to produce a 30-minute tape which was subsequently shown on the local PBS channel.

A second meeting was held with the NAACP Board on May 21, 1980 to informally discuss impacts to the shellfish industry, land use, population, DHEC sampling results, and alternatives for effluent disposal being developed by the EIS consultants. The conversations emphasized impacts to the Black Community and its perception of the EIS issues.

The second Review Committee meeting was held on May 22, 1980 at the First Presbyterian Church to review the Environmental Inventory Task Report, wastewater flows, the advantages and disadvantages of spray irrigation for effluent disposal, the viability of a subaqueous outfall, and the acceptability of the continued use of on-lot systems.

The third Review Committee meeting was held on December 8, 1980 to review the Alternatives Development and Evaluation Task Report. In addition, the results of DHEC's non-point sampling program and the EPA Barrier Islands Policy Statement were discussed. As at previous meetings, many island residents continued to insist that the EIS should control development and land use allocations on the island. EPA, DHEC, and the EIS consultants

reiterated that federal and state governments cannot dictate land use planning, and control of growth is strictly a local issue.

A third meeting was held with the NAACP Board on December 9, 1980 to summarize the Alternatives Development and Evaluation Task Report and solicit comments. Discussion focused mainly on alternatives suitable for non-PSD areas.

A public meeting was held December 9, 1980 at the Hilton Head Elementary School to present the findings of the Alternatives Development and Evaluation Task Report. Approximately 120 citizens attended and 13 made formal statements from the floor. Charles Jeter of DHEC presented his agency's position on maintenance of SA water quality.

A series of informal meetings were held on August 11, 1981 with those agencies who would have responsibility for implementing the selected alternative. Groups involved were the Beaufort County Commission, the County Attorney, the South Carolina Coastal Council, and PSD representatives.

CHAPTER VI - LIST OF PREPARERS

Project Personnel

U. S. Environmental Protection Agency

Robert B. Howard	Chief, EIS Preparation Section
Robert C. Cooper	EIS Project Officer
William J. Patton	Chief, S.C./Tenn. Facilities Planning Section

Consultants

Gannett Fleming Corddry and Carpenter, Inc.

Thomas M. Rachford	Senior Project Manager
D. Randolph Grubbs	Project Manager
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Henry F. Wilson, Jr.	Assistant Project Engineer
Paul Andre DeGeorges	Environmental Scientist
John W. Jacobs	Environmental Scientist

Claude Terry & Associates, Inc.

Claude E. Terry	Project Executive
Louise B. Franklin	Project Manager, Environmental Planner
Robert J. Hunter	Environmental Scientist
Thomas C. Mather	Environmental Scientist

APPENDIX A

MEMORANDUM FROM EPA WATER
QUALITY STANDARDS SECTION

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

DATE: December 5, 1980

SUBJECT: WLA - Hilton Head, South Carolina

FROM: Water Quality Standards Section

TO: Robert Cooper
EIS Branch

SUMMARY:

We have reviewed the WLA's developed by South Carolina DHEC for Hilton Head South Carolina. Our analysis indicates that for the .45 mgd Sea Pine discharge, effluent limits of 10 mg/l BOD₅, 1.5 mg/l NH₃, and 5 mg/l DO is adequate to insure that the 5 mg/l dissolved oxygen criterion will be met in Lawton Creek and Lawton Canal. However, according to a Food and Drug Administration report, any discharge into Lawton Canal would close the canal, Lawton Creek, and portion of Broad Creek to shellfish harvesting. Since this would preclude the attainability of a use, we have determined that the WLA should be 'No Discharge'. If the designated shellfish harvesting use was an actual use on or after November 28, 1975, then there are no allowances for eliminating the use. If the use was never attained during that period, then the use can only be eliminated if it is environmentally, technologically, or economically unattainable.

We have no objection to the WLA's for the discharges to Calibogue Sound or Port Royal Sound, as long as they do not also result in the closure of shellfish harvesting areas.

Robert F. McGhee
Robert F. McGhee

APPENDIX B

LETTER FROM SOUTH CAROLINA
WILDLIFE AND MARINE RESOURCES
DEPARTMENT



*South Carolina
Wildlife & Marine
Resources Department*

James A. Timmerman, Jr., Ph.D.
Executive Director
Pat Ryan
Director of
Law Enforcement and Boating

December 8, 1980

Steve Hopkins
P. O. Box 478
Port Royal, South Carolina 29935

Mr. Robert Cooper
EPA
EIS Project Offices
345 Courtland St., N. E.
Atlanta, Georgia 30308

Dear Bob,

In reviewing the Draft Alternatives Development and Evaluation Talk Report for the Hilton Head Island Environmental Impact Statement I was distressed to see how lightly EPA has treated the possible effects of marine disposal of treated wastewater. As a result, Marine Resources Division would like to issue strong objections to the alternative evaluations as they are presented therein. Not only does this report make some questionable assumptions about the impact of marine discharges but they have evidently ignored the fact that an EPA condonation of new marine outfalls will set a precedent which would eventually result in significant deterioration of the state's marine resources.

The problem evidentially stems from a failure on the part of EPA to recognize that treated wastewater may have many serious adverse impacts on the marine environment in addition to being the source of a possible human health problem. Sewage outfalls in the marine environment have long existed on the coasts of the U.S. but until recently, it was thought that their impact was limited to excessive bacterial contamination of water and shellfish which could result in the outbreak of diseases in the human population. However, research within the past few years has shown that a sewage discharge into the marine environment may affect the system in ways which are subtle but, with time, can severely limit natural production. Ironically, a treated discharge can in many instances be more destructive to marine life than the raw sewage. A few of the deleterious effects associated with treated sewage outfalls are salinity alterations, changes in the species composition of the phytoplankton population due to excessive nutrient loads, changes in the BOD due to excessive nutrients, and the toxic effects of the disinfecting agent and ancillary pollutants.

The effect of a change in salinity due to the presence of sewage treatment outfall are obvious. While the area in question is populated by many estuarine species which are euryhaline in nature and can adapt to a wide range of

salinities, there are also some stenohaline organisms which would not normally be found in an estuarine system except for the fact that Calibogue Sound maintains a relatively high salinity. Routine sampling by the RV Carolina Pride in conjunction with the shrimp management program has revealed the existence of several species of fish and invertebrates in the vicinity of Buck Island and Bram's Point which are highly intolerant of dilute salinities. Among other organisms, trawl catches included Lane Snapper (Lutjanus synagris), Gag Grouper (Mycteroperca micropelis), Rock Sea Bass (Centropristis philadelphica), Spadefish (Chaetodipterus faber) and various species of coral and sponge (4). These animals would be displaced or killed by high volumes fresh water entering the system. Overall, the degree of species diversity in Calibogue Sound and adjacent tributaries would be decreased through a reduction in the salinity.

The species composition of the phytoplankton population in the area around the outfall would also be altered by the changes in salinity and nutrient load. While a change in the species composition of phytoplankters is not easily noticed by the layman, or for that matter the scientist, it has a dramatic affect upon the organisms which rely upon the algae for subsistence. Often, excessive nutrients will favor population explosions of blue-green algae at the expense of green algae and diatoms (6). The blue-greens have a lower food value to primary consumers such as shellfish and the zooplankters which support most of the other recreationally and economically valuable species through the food chain. Therefore, while the total primary production may increase, the primary producers will be of a type which cannot support the naturally occurring levels of production.

A shift in the species composition of the algae population from greens and diatoms to dense blooms of blue-greens through excessive nutrient loading will also increase the BOD and make the system more susceptible to dissolved oxygen depletion and the resultant fish kills. (2)

The changes in the ecosystem mentioned above, while serious in themselves, are overshadowed by a yet more damaging agent. Research conducted over the past few years has shown that the addition of large quantities of chlorine to the marine environment is extremely damaging. The best example is the Chesapeake Bay where the cumulative effect of a large number of treated sewage outfalls is believed by some to be the primary agent responsible for the declining fishery resources in what has historically been the largest seafood producing area in the country. The problem in that area is perceived to be so serious that the Tidewater Administration of the state of Maryland may back a bill in that legislature to ban all chlorinated discharges to surface waters (18). The toxic affects of chlorine has been demonstrated for a large number of marine organisms, many of which exist in Calibogue Sound and it's tributaries. A few examples of organisms to which chlorine is toxic are the Rockfish or striped bass (Morone saxatilis) (9), Spotted Seatrout (Cynoscion nebulosus) (5), Spot (Leiostomus xanthurus) (11), Atlantic Silversides (Menidia menidia) (8), Blue Crabs (Callinectes sapidus) (7), Mud Crabs (Panopeus herbstii) (10, 13), Hermit Crabs (Pagurus longicarpus) (10, 13), Hard Clams (Mercenaria mercenaria) (12), American Oysters (Crassostrea virginica) (12, 15, 16, 17) and lower down the food chain, a copepod (Acartia tonsa) (3).

Several fish kills in Maryland have been attributed to chlorine toxicity (1). In addition, a 1977 report to the U.S. Congress by the Comptroller General encouraged EPA to stop unnecessary and harmful levels of domestic sewage chlorination (19).

In describing the impact of Alternatives IV-1, IV-2 and IV-3 on surface

water quality it is stated that there will be no significant impact on Lawton Creek when the existing outfall is removed. This statement is objectionable since the outfall, even at it's present level, is damaging the adjacent marine ecosystem as described above. Also, the report indicates there would be a minor impact associated with an increase in aquatic plants and algae due to elimination of residual chlorine. A return to normal primary production must be considered a significant impact.

In Alternative IV-4 it is stated that there will be no impact from maintaining the present level of nutrient loading and salinity modification. This statement is objectionable since it assumes that the present outfall is not damaging to the system. Damage is certainly being done, but without the opportunity to collect baseline data before the unauthorized outfall was initiated, it is impossible to quantify.

Discussion of the impacts of Alternative IV-5 note that the effect on Calibogue Sound will be minor due to it's large assimilative capacity. This is poor reasoning. Even though the impact may be, at first, unmeasurable the laws of nature dictate that any pollution or modification of the water quality must have some effect. In addition, this outfall will set a precedent for deepwater disposal of treated sewage which, when multiplied many times through the continued development of coastal areas, will eventually result in very definite and serious adverse effects.

The assessment of the impacts of Alternative IV-6 are also objectionable. It states that the excessive nutrient loading of Lawton Creek will have minor impact. As explained above, changing the species composition of the primary producer should be categorized as a significant adverse impact.

Objectionable points in the discussion of Alternative IV-7 are the same as those mentioned for Alternative IV-5. The checklist of environmental impacts on the natural environment should make note of a negative impact of Alternative IV-7 on surface water quality.

Objectionable points in Alternative IV-8 and IV-9 are the same as for Alternative IV-1.

Objectionable points of Alternative IV-10 and IV-11 are the same as for Alternatives IV-6 and IV-1 respectively.

The checklist of impacts on the natural environment should reflect a negative impact on the aquatic ecosystem for Alternatives IV-4, IV-5, IV-6, IV-7, IV-10, and IV-11. In addition, these impacts should be classified as significant or major.

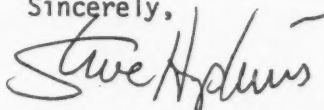
EPA assessment of the impacts on the manmade environment with regard to natural resource use are very much out of line. It is well known that one of the features of Hilton Head Island that makes it appealing is the fine recreational opportunities associated with utilization of the marine resources. However, the Natural Resource Uses impact assessment does not make mention of the severe adverse effects of Alternatives IV-4, IV-5, IV-6, IV-7, IV-10 and IV-11 on recreational opportunities. As noted above, an outfall and the precedent it sets can severely limit the production of important recreationally and commercially exploited species, such as crabs, oysters and finfish. For these six alternatives which involve a marine outfall, the significant positive impact bought about by conservation of the ground water resources will be offset by significant negative impacts on the marine life. A more sensible approach would be to relay the excess effluent from the Sea Pines, Forest Beach PDS to areas which can not meet the irrigation requirements of

their golf courses with the available treated effluent. In this way, the positive impacts will be increased while eliminating the negative impact of marine disposal.

- (1) Berlitz, A. (1980). Villian in Disguise. Atlantic States Marine Fisheries Commission Meeting, October 1980, Hershey, PA.
- (2) Garside, C. et al. (1976). Evaluation of sewage derived nutrients and their influence on Hudson Estuary. ESTUARINE AND COASTAL AMRINE SCIENCE 4:281-289.
- (3) Heinle, D. R. and M. S. Beaven (1977). Effects of Chlorine on the Copepod Acartia tonsa. CHESAPEAKE SCIENCE 18 (1):140.
- (4) Jenkins, J (1980). Crustacean Management Section, Office of Conservation Management and Marketing, Marine Resources Division. Personl Communication.
- (5) Johnson, A. G. et al. (1977). Chlorine-Induced Mortality of Eggs and Larvae of Spotted Seatrout (Cynoscion nebulosus). TRANSACTIONS OF THE AMERICAN FISHERIES SOCIETY 106 (5):466-469.
- (6) Kosaric, N and H. T. Nguyen (1974). Growth of Spirulina maxima in Effluents from Waste Treatment Plants, BIOTECHNOLOGY AND BIOENGINEERING 16:881-896.
- (7) Laird, C. E. and M. H. Roberts (1979). Effects of Chlorinated Seawater on the Blue Crab, Callinectes sapidus. WATER CHLORINATION, ENVIRONMENTAL IMPACT AND HEALTH EFFECTS, Vol. 3, R. L. Jolly, Ed. (Ann Arbormmi: Ann Arbor Science Publishers, Inc., pp. 569-579.
- (8) Meldrim, J. M. and J. A. Fava, Jr. (1977). Behavioral Avoidance Responses of Estuarine Fishes to Chlorine. CHESAPEAKE SCIENCE 18 (1): 154-157.
- (9) Middaugh, D. P. et al. (1977). Responses of Early Life History Stages of the Striped Bass, Morone saxatilis to Chlorination. CHESAPEAKE SCIENCE 18 (1)-141-153.
- (10) Roberts, M. H. (1977). Effects of Chlorinated Seawater on Decapod Crustaceans. WATER CHLORINATION, ENVIRONMENTAL IMPACT AND HEALTH EFFECTS, Volume 2, R. L. Jolly Ed. (Ann Arbor, MI: Ann Arbor Science Publishers, Inc., pp. 329-339.
- (11) Roberts, M. H. (1979). Survival of Juvenile Spot (Leiostomus xanthurus) Exposed of Bromochlorinated and Chlorinated Sewage in Estuarine Waters. MARINE ENVIRONMENTAL RESEARCH 3:63-80.
- (12) Roberts, M. H. et al. (1975). Acute Toxicity of Chlorine to Selected Estuarine Species. JOURNAL OF THE FISHERIES RESEARCH BOARD OF CANADA 32 (12): 2525-2528. B-5

- (13) Roberts, M. H. et al. (1979). Effects of Chlorinated Seawater on Decapod Crustaceans and Mulinia Larvae. U. S. Environmental Protection Agency Report EPA-600/3-79-031, Environmental Research Laboratory, Gulf Breeze, FL.
- (14) Roop, R. (1980). Technical Manager of Environmental Products, Fisher Porter, Inc., Warminster, PA, Personal Communication.
- (15) Scott, G. I. and Middaugh, D. P. (1977). Seasonal Chronic Toxicity of Chlorination to the American Oyster, Crassostrea virginica. WATER CHLORINATION, ENVIRONMENTAL IMPACT AND HEALTH EFFECTS, Volume 2, R. L. Jolly, Ed. (Ann Arbor MI: Ann Arbor Science Publishers, Inc., pp. 311-328.
- (16) Scott, G. I. et al. (1979). Physiological Effects of Chlorine Produced Oxidants and Subsequent Uptake of Chlorination By-Products in the American Oyster, Crassostrea virginica. Environmental Protection Agency Report, Bears Bluff Laboratory, Wadmalaw Island, SC.
- (17) Scott, G. I. And W. B. Vernberg (1979). Seasonal Effects of Chlorine Produced Oxidants on the Growth, Survival and Physiology of the American Oyster, Crassostrea virginica. MARINE POLLUTION: FUNCTIONAL RESPONSES. Academic Press, Inc.
- (18) Speir, H. (1980). State of Maryland Depaartment of Natural Resources, Tidewater Administration. Personal Communication.
- (19) United States Comptroller General (1977). Report to the Congress, Unnesessary and Harmful Levels of Domestic Sewage Chlorination Should Be Stopped. Government Accounting Office Report CED-77-108.

Sincerely,



Steve Hopkins
Regional Biologist
OCMM

JSH/kh

cc: Charles M. Bearden, Director,
Office of Conservation, Management and Marketing
Marine Resources Division

Rob Dunlap, Section Leader,
Environmental Control, OCMM, Marine Resources Division

B-6

APPENDIX C

LETTER FROM SOUTH CAROLINA
DEPARTMENT OF HEALTH AND
ENVIRONMENTAL CONTROL

RECEIVED SEP - 2 1980

South Carolina
Department of
Health and
Environmental
Control

BOARD
William M. Wilson, Chairman
J. Lorin Mason, Jr., M.D., Vice-Chairman
I. DeQuincey Newman, Secretary
Leonard W. Douglas, M.D.
George G. Graham, D.D.S.
Michael W. Mims
Barbara P. Nuessle

COMMISSIONER
Robert S. Jackson, M.D.
2600 Bull Street
Columbia, S. C. 29201

August 29, 1980

Mr. D. Randolph Grubbs
Gannett, Fleming, Cordory and Carpenter
Number 11, Koger Executive Center
Suite 250
Norfolk, Virginia 23502

Dear Randy:

In response to your request, we have analyzed the effects of discharges from Hilton Head Island as proposed in your letter of August 12, 1980. Based on our analysis, proposed discharges would be subject to effluent limits as follows:

1. Sea Pines PSD discharge to Lawton Canal at existing location. The system is so complex that present modeling techniques do not appear to apply. Based on the nature of the system, we believe advanced treatment to the following levels are applicable:

<u>Discharge Flow</u>	<u>BOD₅</u>	<u>NH₃</u>	<u>Tot. Colif.</u>	<u>TSS</u>	<u>D.O.</u>
0.70 MGD	10 mg/l	1.5 mg/l	70/100 ml	15 mg/l	5.0 mg/l
1.0 MGD	10 mg/l	1.5 mg/l	70/100 ml	15 mg/l	5.0 mg/l
2.0 MGD	10 mg/l	1.5 mg/l	70/100 ml	15 mg/l	5.0 mg/l
3.0 MGD	10 mg/l	1.5 mg/l	70/100 ml	15 mg/l	5.0 mg/l

2. Sea Pines PSD discharge to Calibogue Sound:

<u>Discharge Flow</u>	<u>BOD₅</u>	<u>NH₃</u>	<u>Tot. Colif.</u>	<u>UOD</u>	<u>TSS</u>
3.0 MGD	30 mg/l	---	70/100 ml	---	30 mg/l

Secondary treatment would be adequate. Additional assimilative capacity is available. The limitation on TSS is what is required by secondary treatment. At high levels of BOD removal, TSS should be well within 30 mg/l.

3. Hilton Head PSD No. 1 discharge to Port Royal Sound:

<u>Discharge Flow</u>	<u>BOD₅</u>	<u>NH₃</u>	<u>Tot. Colif.</u>	<u>UOD</u>	<u>TSS</u>
0.2 MGD	30 mg/l	---	70/100 ml	---	30 mg/l

Secondary treatment would be adequate. Additional assimilative capacity is available.

C-2

Letter to Mr. D. Randolph Grubbs

Page 2

August 29, 1980

For any discharge to Calibogue Sound, a maximum of 9,000 lbs. UOD/day is allowable to reach 4 shown on the enclosed map. This allowable load was determined as part of the Low Country 208 planning program. The discharge point would have to be located in a deep part of the sound to ensure maximum mixing and dispersion. A discharge of secondary effluent at 3.0 MGD would produce a load of 3,378 lbs/day of UOD.

For any discharge to the lower portion of Port Royal Sound, a maximum load of 28,000 lbs/day of UOD is allowable to reach 9 shown on the enclosed map. This allowable load was also determined as part of the Low Country 208 planning program. Any discharge here would also have to be located in a deep part of the sound to ensure maximum mixing and dispersion of the effluent.

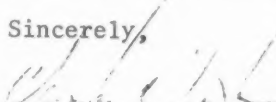
"Buffer Zones" for the proposed discharges are very difficult to define. The FDA guidelines use terminology of "Safety Area" for what we have called buffer zone. There should be reasonable assurance when treatment facility malfunctions occur resulting in a non disinfected wastes discharge that State Health Authorities would be notified and the affected area closed to shellfish harvesting within a 24 hour period. In past application of the buffer zone policy, the affected area has been assumed to be that area to which the pollutant would disperse within 2 tidal cycles (approximately 24 hours). It is not possible to reduce the buffer zone by having a disinfected discharge enter a retention pond with a retention time of at least 24 hours. This will merely allow DHEC to have more response time to monitor the affected area and determine bacteria levels in surrounding areas. During normal operation certain areas outside the buffer zone could be conditionally approved for shellfish harvesting. This may be a consideration for a discharge to Lawton Canal. However, it should not be a concern for discharges to Calibogue Sound or Port Royal Sound. We cannot create other hypothetical situations to analyze their effect on buffer zone boundaries. If you wish to propose specific alternatives, we would be willing to respond to them.

The buffer zone for the present Sea Pines PSD discharge to Lawton Canal includes all of Lawton Creek to its confluence with Broad Creek. It also includes 1,000 feet of the east bank of Broad Creek North and South of Lawton Creek. According to a Food and Drug Administration report (December 1978), if the discharge was increased to 4 MGD, the buffer zone would be extended to just above Harbor Town Marina to the South and to the Northern tip of Buck Island in the Norther direction. Conditionally approved areas will be moved to include all of Palmetto Bay and all of Harbor Town Marina.

If the proposal is to discharge treated wastewater to Lawton Canal, the use of backup systems, holding basins, and emergency alarm systems could reduce the size of the conditionally approved area.

If I can be of further assistance, please do not hesitate to call.

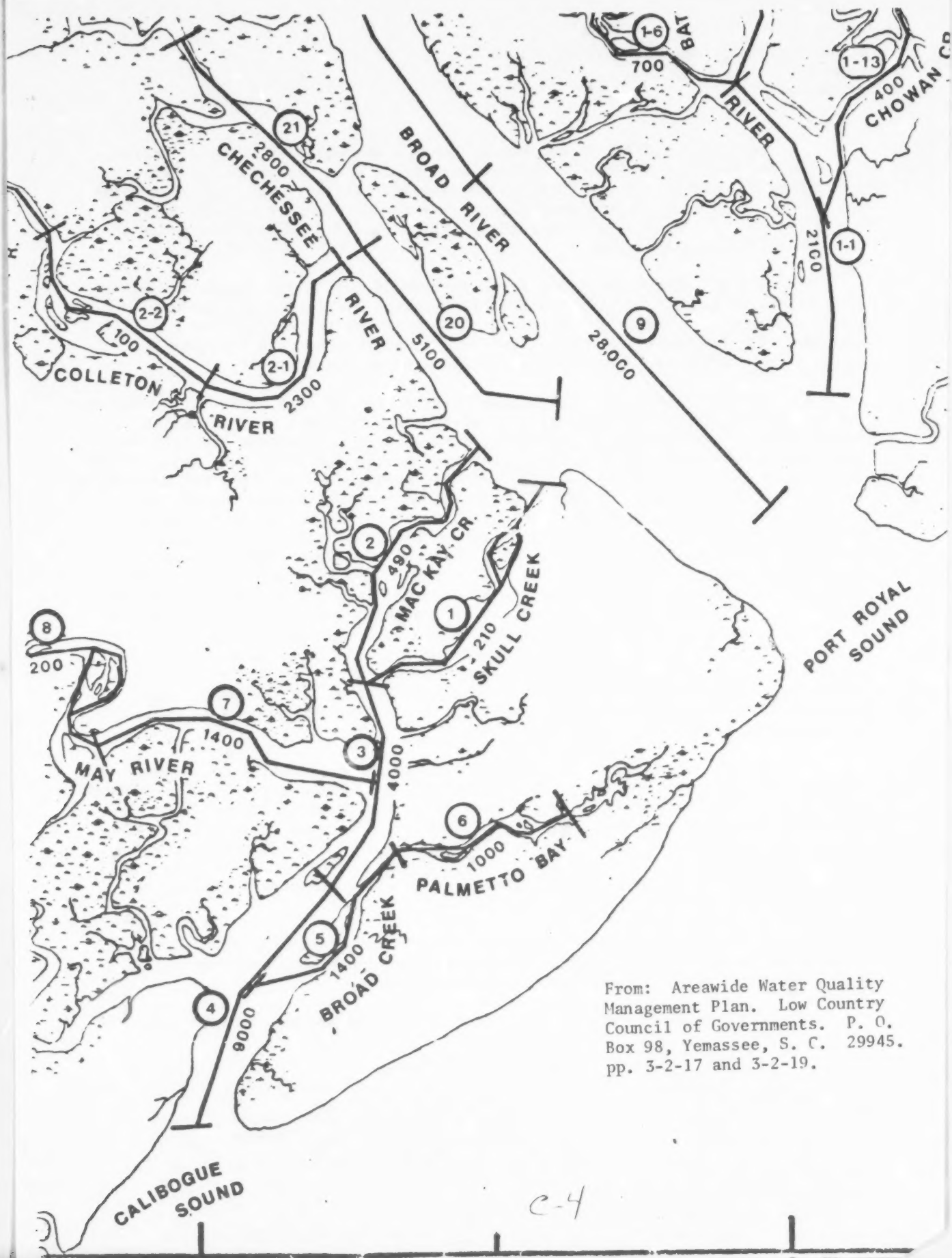
Sincerely,


Charles R. Jeter, P.E., Chief
Bureau of Wastewater & Stream
Quality Control

CRJ:CES/skb

cc: Robert Cooper, EPA
Roger Davis, SCDHEC
Luke Hause, SCDHEC

C-3



APPENDIX D

LETTER FROM OFFICE OF THE
ATTORNEY GENERAL FOR THE
STATE OF SOUTH CAROLINA

RECEIVED JUN 26 1981

HOWELL, BARNES, BOWERS AND GIBSON, P.A.

ATTORNEYS AT LAW

LADSON F. HOWELL
A. PARKER BARNES, JR.
H. MICHAEL BOWERS
JAMES S. GIBSON, JR.
STEPHEN P. HUGHES

June 18, 1981

1214 KING STREET
POST OFFICE BOX 40
BEAUFORT, SOUTH CAROLINA 29902
803 - 524-3433

Mr. Robert Cooper
Environmental Protection Agency
Environmental Impact Statement Branch
345 Courtland Street
Atlanta, GA 30365

RE: Sea Pines Public Service District--Condemnation Authority

Dear Mr. Cooper:

By letter of April 23, 1981, I requested a written opinion of the Attorney General in answer to the following questions regarding the extent to which the power of eminent domain may be exercised by the Sea Pines Public Service District and/or the County of Beaufort:

1. As a means of disposing of waste water, the Sea Pines Public Service District proposes to irrigate private property with such waste water. Is the condemnation authority of the Sea Pines Public Service District sufficient to allow it to take private property outside its district boundaries for such purposes?

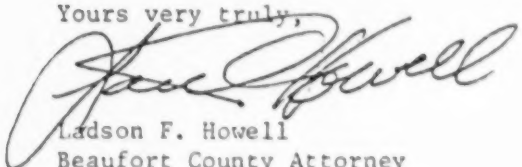
2. Is the condemnation authority of the County of Beaufort sufficient to allow it to take private property for such purposes in the name of the public service district?

The responsive opinion of the Attorney General is enclosed for your consideration.

It appears that the Sea Pines Public Service District, for the reasons enumerated in the opinion, is without condemnation authority sufficient to allow it to take private property outside its district boundaries. However, it is the further opinion of the Attorney General that the condemnation authority of the County of Beaufort may be used to assist the Sea Pines Public Service District in the control of waste water.

Should you have any questions regarding the content of this correspondence, please do not hesitate to contact me.

Yours very truly,


Ladson F. Howell
Beaufort County Attorney

LFH:cmb

Enclosure

cc: M. O'Neill and A. Horner

xc: T. M. Rachford
Central File: Hilton Head EIS
Job No. 8021.00

D-2

The State of South Carolina



Office of the Attorney General

DANIEL R. McLEOD
ATTORNEY GENERAL

REMBERT C. DENNIS BUILDING
POST OFFICE BOX 11549
COLUMBIA S.C. 29211
TELEPHONE 803-758-2072

June 10, 1981

Stephen P. Hughes, Esquire
Assistant County Attorney
Beaufort County
Post Office Box 40
Beaufort, South Carolina 29902

Re: Sea Pines Public Service District - Condemnation
Authority

Dear Mr. Hughes:

You have asked whether or not the Sea Pines Public Service District may use its power of eminent domain to condemn private property outside its boundaries for the purpose of disposing of waste water. You have also inquired whether, if the answer to the first question is negative, the County of Beaufort may condemn the property for such purposes in the name of the Public Service District.

The Sea Pines Public Service District was created by Act 1158, Acts and Joint Resolutions (1964) to provide certain services deemed necessary by the General Assembly to protect the health of the rapidly increasing population of Hilton Head Island. Among its enumerated powers are building, constructing, and operating such waterworks, sewage facilities, and medical clinics found necessary by the governing Commission. In order to accomplish the objectives of the District the General Assembly also granted the governing commission the power of eminent domain. There is no question that, upon approval of the appropriate State and Federal Environmental Protection Agencies, the District could condemn private property within the boundaries of the District for disposal of waste water in the manner described in your letter. However, there is no statutory grant of jurisdiction or authority to the Commission for any purpose whatsoever beyond the boundaries of the District.

D-3

Stephen P. Hughes, Esquire
Page Two
June 10, 1981

The General Assembly expressly granted municipalities some latitude in condemning property outside their corporate boundaries. Section 28-9-110, Code. By another statute, the Legislature granted private water companies all of the rights and powers possessed by municipalities relative to water service. Section 58-7-30, Code. It logically follows that, if the Legislature had intended to grant to the Commission the power of eminent domain over property outside the boundaries of the District, it would have done so by express provision. Because the District is a creature of statute, it possesses only that authority expressly granted in the statute or that which is incidentally necessary for the exercising of expressly granted authority. Richland County Department of Public Welfare v. Mickens, 246 S.C. 113, 142 S.E.2d 737 (1965). Although condemning property outside the District boundaries might enhance or improve the operation of the District, it is not incidentally necessary for the operation of the District. It is, therefore, the opinion of this office that the Sea Pines Public Service District may not exercise the power of eminent domain outside its statutorily defined boundaries.

As to your second question, the only relevant limitation upon the exercise of eminent domain by Beaufort County is that the taking must be for a County purpose. Section 4-9-30, Code. It is evident that the harm to the environment from pollution of the coastal waters and marshes presents a danger to inland residents of Beaufort County to almost as great a degree as those living within the Public Service District itself. The General Assembly obviously recognized this fact when it created the District to control sewage disposal and the distribution of drinking water, making a finding, in part, that:

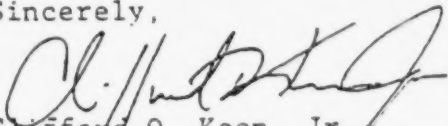
"The development of recreational facilities and multi-unit accommodations, in the nature of inns, clubs, and apartment buildings, will make construction of a sewage disposal system a health necessity." Act 1158, Section 2, Acts and Joint Resolutions (1964).

Having determined that the control of sewage disposal in the rapidly developing coastal zone of Beaufort County is a proper county function, it is the opinion of this office that Beaufort County may use its power of eminent domain to assist the Sea Pines Public Service District in the control of waste water.

Stephen P. Hughes, Esquire
Page Three
June 10, 1981

I trust this has sufficiently answered your questions.
If not, please feel free to contact us at your convenience.

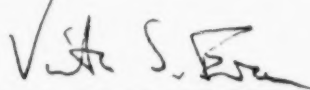
Sincerely,



Clifford O. Koon, Jr.
Assistant Attorney General

COKjr:prl

REVIEWED AND APPROVED BY:



Victor S. Evans
Deputy Attorney General

D.5